

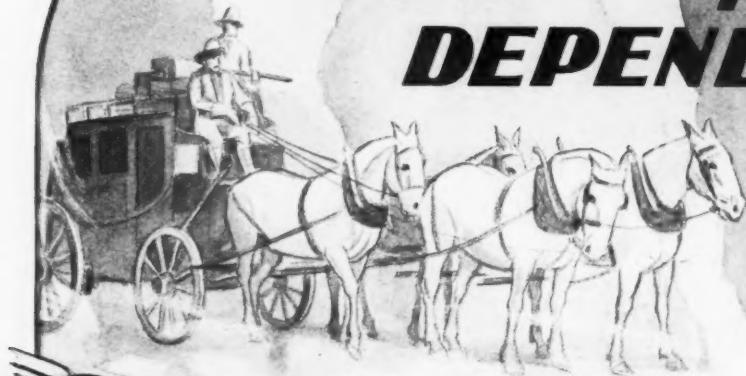
The **MINING CONGRESS JOURNAL**

IN THIS ISSUE

**The
Economic Importance
of the
Mineral Industries**

**MARCH
1935**

PREFERENCE based upon DEPENDABILITY



OF the many elements which enter into the preference for one service or product over that of another, there is nothing more important than dependability. Weary travelers welcomed the dependability of railroads after experiencing the uncertainties and the many disadvantages of the stage coach.

Knowing full well the value of dependability in mining line material, the Ohio Brass Company has made certain that all of its products measure up to this requirement. It is not at all unusual for O-B hangers, clamps, and expansion bolts to take the punishment of severe mine service for twenty years and more without giving the slightest trouble. Such performance means no delays, lower production costs, and greater profits. Mine operators everywhere have learned to prefer O-B line material because of its proven dependability.

1752M



Just as weary travelers preferred railroads because of their increased dependability, so do profit-wise mine operators prefer O-B hangers, clamps, and expansion bolts.

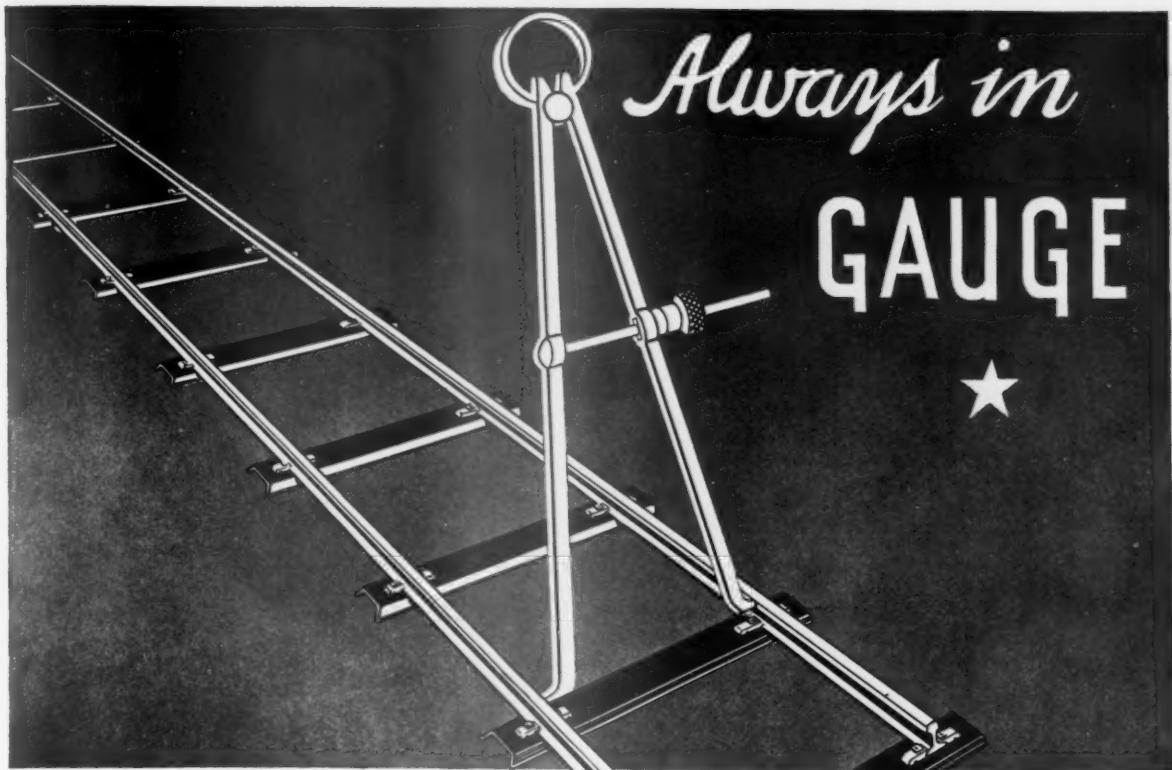
OHIO BRASS COMPANY

Mansfield,  Ohio, U. S. A.

Canadian Ohio Brass Co. Limited Niagara Falls, Ontario, Canada

New York • Philadelphia • Boston • Pittsburgh • Chicago • Cleveland
Atlanta • Dallas • Los Angeles • San Francisco • Seattle





Always in GAUGE



• "Always in Gauge" is the principal requisite of a good track . . . and a guaranteed feature of Carnegie Steel Mine Ties. Carnegie Ties are furnished in six styles. Heavy-duty channel ties for main haulage. Shallow, light-weight ties for room work. A variety of rail clips, attached or separate as you may prefer, are also available, all of them quickly and easily fastened. A hammer blow, or the turn of a wrench and the rail is firmly held, automatically true to gauge for the life of the tie. Why not call in a Carnegie representative to discuss your track problems with you?

CARNEGIE STEEL COMPANY • PITTSBURGH



312

CARNEGIE Steel Mine Ties

United States Steel  Corporation Subsidiary

MARCH, 1935

3

The MINING CONGRESS JOURNAL

MARCH
1935



VOLUME 21
NUMBER 3

Editorials:

Legislation for Coal	14
Rehabilitation vs. The Dole.....	14
Business Surveillance	14
Modernizing Industry	14
The Gold Decision.....	15
Labor's Struggles	15
On Distributing Wealth	15

Feature Article:

The Economic Importance of the Mineral Industry.....	16
--	----

By M. W. Von Bernewitz

Legislation:

Wheels of Government.....	49
Of All Things.....	61
The Six-Hour Day and Thirty-Hour Week.....	62

By Julian D. Conover

Practical Operating:

Bit Sharpening Economies.....	52
<i>By Foster L. Apple</i>	
Hoist Installation at U. S. Potash Company's Mine.....	53
<i>By C. A. Pierce</i>	
Snubbing	54
<i>By D. A. Wilcox</i>	
Underground Railways in the Unseen Empire.....	56
Power Economies.....	57
<i>By Geo. J. Rathjens</i>	
Hoisting Problems in Lead-Silver Mines of Utah.....	59
<i>By Leonard Wilson</i>	

News of the Field:

National Committee Rehabilitation, Bureau of Mines.....	64
American Institute of Mining and Metallurgical Engineers Hold Annual Meeting	66
Mining Events.....	67
News of Manufacturers.....	77
Personals	79

J. F. CALLBREATH
Contributing Editor

E. R. COOMBES
Editor

HOWARD B. DRISCOLL
Advertising Manager

G. B. SOUTHWARD
Associate Editor

B. E. CHAMBERS
Asst. Advertising and Business Mgr.



Published by The American Mining Congress, JULIAN D. CONOVER, Secretary, Washington, D. C. Copyright, 1933, by The American Mining Congress, Munsey Bldg., Washington, D. C. Entered as Second Class Mail Matter January 30, 1915, at the Post Office at Washington, D. C. Published 12 times annually—the first of each month. Yearly subscription, United States and Canada, \$3.00; Foreign, \$4.00; single copies, \$0.30.

A Tower of Torture for Wire Rope



ONE OF THE WORLD'S LARGEST PRECISION TESTING MACHINES

This giant testing machine has a capacity of $2\frac{1}{2}$ million pounds, is 43 feet high, and weighs 138 tons. Routine specification tests of Roebling Rope are made on this and other Roebling testing machines which range in size down to 200 pounds capacity.



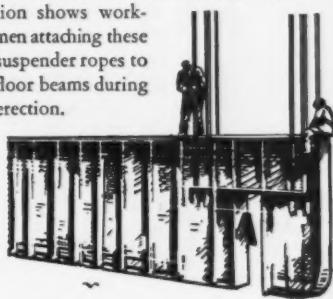
CAN PULL APART
6" SQUARE
STEEL BAR

CAN CRUSH
CAST IRON COLUMN
15' LONG, 15" DIAM.,
WITH $1\frac{1}{4}$ " WALLS



CAPABLE OF TESTING LARGEST ROPES MADE

It was first used for tension testing the huge $2\frac{1}{2}$ inch Roebling Suspender Ropes for the George Washington Memorial Bridge, between New York and New Jersey. Illustration shows workmen attaching these suspender ropes to floor beams during erection.

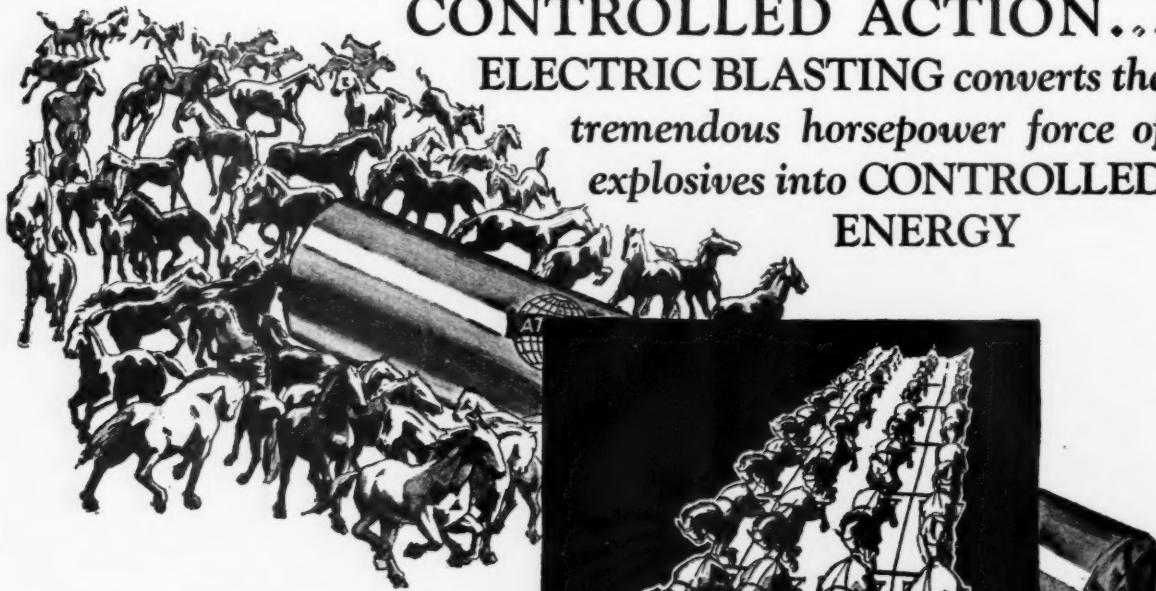


FOR YOUR PROTECTION: To make certain that Roebling Wire Rope will give the user the highest obtainable degree of safe, economical service, Roebling has left no stone unturned. It has enlisted the aid of the finest and most complete research, testing and manufacturing facilities. This testing machine is an example. John A. Roebling's Sons Company, Trenton, N.J. Branches in Principal Cities.

ROEBLING . . . THE PACEMAKER IN
WIRE ROPE DEVELOPMENT

Transforms the THUNDERING HERD *into*
CONTROLLED ACTION...

ELECTRIC BLASTING converts the
tremendous horsepower force of
explosives into CONTROLLED
ENERGY



Electric blasting insures unquestioned mastery of timing. Electric blasting makes possible the simultaneous firing of many charges. It permits testing of caps and circuits before, during and after loading.

Electric blasting causes the explosive to detonate at its normal rate, thus permitting the selection of an explosive with just the right velocity.

The consequence is that the user gets maximum yardage, favorable breakage or fragmentation, controlled back-break, and a controlled throw of rock to place it where it is wanted—with a maximum of safety and economy.

Let the Atlas representative show you how Atlas Electric Blasting provides the ultimate in control of blasting operations.



ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

Allentown, Pa.
Boston, Mass.
Butte, Mont.
Denver, Colo.
Houghton, Mich.

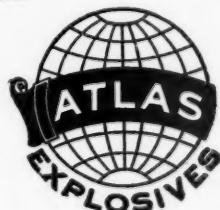
Joplin, Mo.
Kansas City, Mo.
Knoxville, Tenn.
Los Angeles, Calif.
Memphis, Tenn.

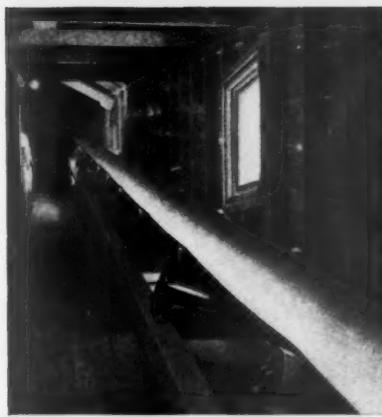
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Picher, Okla.
Pittsburg, Kansas

Pittsburgh, Pa.
Portland, Oregon
Salt Lake City, Utah
San Francisco, Calif.
Seattle, Wash.

Spokane, Wash.
St. Louis, Mo.
Tamaqua, Pa.
Wilkes-Barre, Pa.

ATLAS
EXPLOSIVES





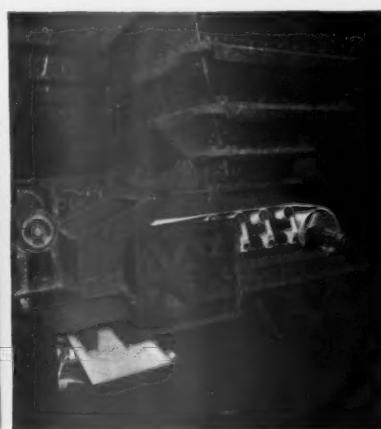
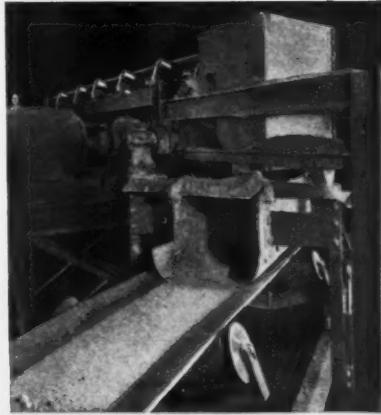
LINK-BELT BELT CONVEYORS for RELIABILITY

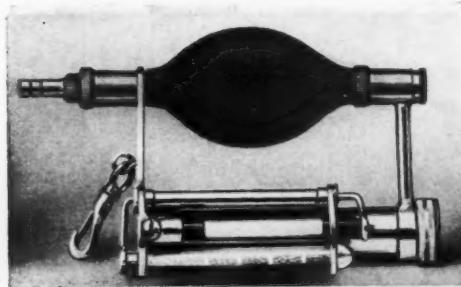
YOU can be sure of low-cost, dependable belt conveyor service by using Link-Belt Anti-Friction Conveyor Idlers, of which there are numerous standard types, each "the best that money can buy" for the purpose. You really can't make the road bed for conveyor belts "too good". This is why Link-Belt concentrates special attention upon the design and construction of the Idlers. Send for catalog and further particulars.

LINK-BELT COMPANY

CHICAGO PHILADELPHIA INDIANAPOLIS
ATLANTA SAN FRANCISCO TORONTO
Denver Seattle Pittsburgh Wilkes-Barre
St. Louis Huntington, W. Va. Kansas City, Mo.
Offices in Principal Cities

5228A





Left—the M.S.A. Carbon Monoxide Detector, a reliable, accurate means of detecting—within ten seconds.—CO concentrations as low as .07%.

M·S·A SAFETY EQUIPMENT



Above—M.S.A. Safety Shoes, with steel safety toes to withstand crushing weights. There are M.S.A. Safety Pacs, too, for wet conditions.



Right—the best available protection for head, eyes, and lungs,—M.S.A. Skull-gards, Miner's Goggles and Comfo-Respirators. Watch for the New Comfo Skullgard,—a new high in wearing comfort.



Above—the Edison Electric Cap Lamp, most popular cap lamp made.—more than 300,000 in daily use.



Above—the M.S.A. Miner's First Aid Cabinet,—just one item in a broad line of First Aid Materials, Cabinets, Kits, and Hospital Equipment that meets every mining requirement.

Below—the M.S.A. Methane Detector, invaluable in checking mine air to prevent gas and dust explosions, or to increase ventilation efficiency.



Above—McCaa Oxygen Breathing Apparatus, 2-Hour Type, so widely known and used that it is regarded everywhere as standard equipment for mine rescue work, etc.



... dedicated to the betterment of mining and to the safety and welfare of the mine-worker in reducing the

PREVENTABLE ACCIDENTS

that cost the mining industry

MILLIONS OF DOLLARS ANNUALLY

Does accident prevention really pay? Can a mine be operated safely and efficiently, at the same time? These were once regarded as debatable questions, but you seldom hear them argued today. Why? Because the alert mining man has discovered, either through his own experience or that of a neighboring operation, that a judicious investment in approved M.S.A. Safety Equipment INVARILABLY deducts dollars from the loss side of his ledger and adds them to the profit side . . . many, many MORE dollars than the cost of the Safety Equipment itself!

That's the economic side of the picture, but every

right-thinking operator looks at it from the humane angle, too . . . the important consideration of saving lives and preventing painful injuries. Unquestionably, safe mining IS efficient mining, in the purest sense of the words,—and to the universal acceptance of that doctrine, M.S.A. Safety Equipment is dedicated.

Bring YOUR problems to Safety Headquarters! The M.S.A. Organization will gladly work with you in formulating plans to better your mining conditions, increase the welfare of your men, and reduce your share of the huge annual bill that the mining industry pays to preventable accidents.

MINE SAFETY APPLIANCES COMPANY

Braddock, Thomas and Meade Streets, Pittsburgh, Pa.

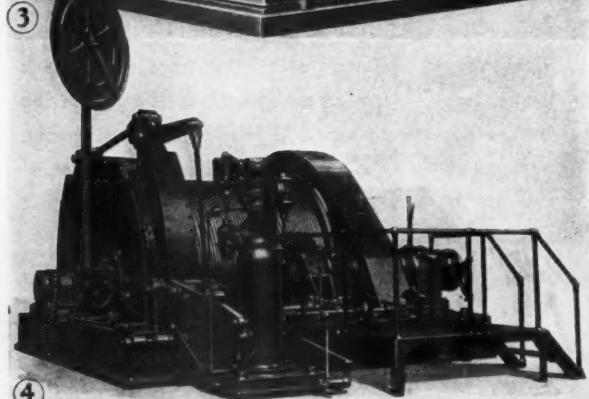
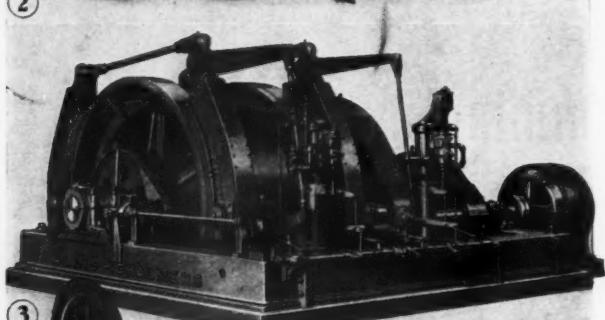
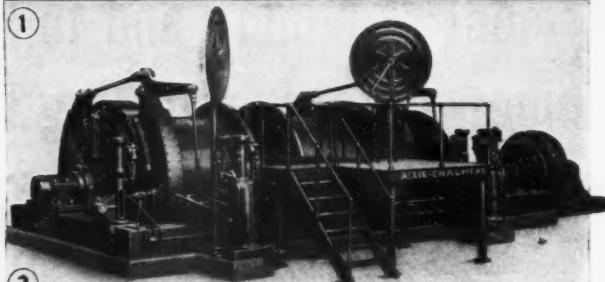
District Representatives in Principal Cities

M.S.A. Products include Breathing Apparatus . . . Inhalators . . . Masks of all types . . . Gas Indicators . . . Gas Detectors . . . M.S.A. Safety Goggles . . . M.S.A. Protective Hats and Caps . . . Edison Electric Cap Lamps . . . Safety Clothing . . . First Aid Equipment . . . Submarine Escape Apparatus . . . Descriptive Bulletins sent on request.

HOISTS

— and

HOIST MOTORS



- ① 56,800-lb. rope pull; 2250-ft. per min.
- ② 46,000-lb. rope pull; 1500-ft. per min.
- ③ 24,600-lb. rope pull; 400-ft. per min.
- ④ 20,000-lb. rope pull; 1800-ft. per min.
- ⑤ 44,000-lb. rope pull; 800/2000-ft. per min.

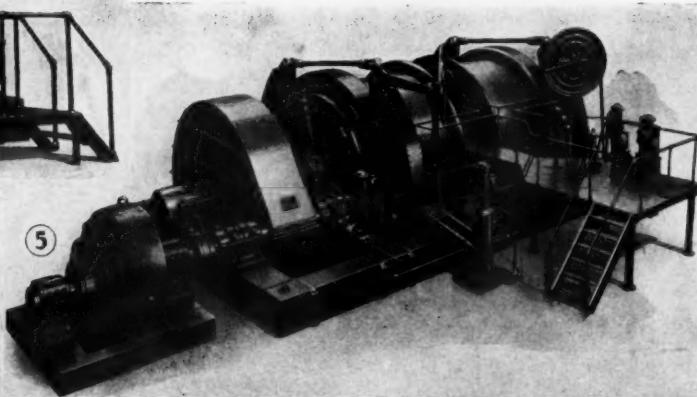
ALLIS-CHALMERS hoists ranging in size from medium to the largest built will be found in all the principal mining centers. They are operating on slopes and shafts, the latter for some of the deepest mines ... hoisting more than a mile. Some are arranged for automatic operation.

Many of the engineering details of Allis-Chalmers hoists are advanced designs pioneered by this Company. Safety devices are of the latest type giving protection in every emergency. Drums are built to meet special conditions.

Allis-Chalmers manufactures both the mechanical and electrical parts of hoists. The importance of this where there are so many interconnected details between mechanical and electrical parts is obvious. When all related factors are taken care of by one organization working out the details in complete co-operation it insures to the purchaser a well balanced design and perfect co-ordination between mechanical and electrical parts.

Allis-Chalmers hoists insure economy and safety in operation for years to come as demonstrated by the many major successful installations in all mining districts.

They are described in Bulletin 1830.



ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

**100% PROTECTION
FEWER SHUTDOWNS
EASY OPERATION WITH G-E CONTROLLERS**

FOR YOUR SYNCHRONOUS MOTORS



This compact panel is one of the most popular members of the family of G-E synchronous-motor controllers. It is typical of full-voltage magnetic controllers used for low-voltage applications—600 volts and below.

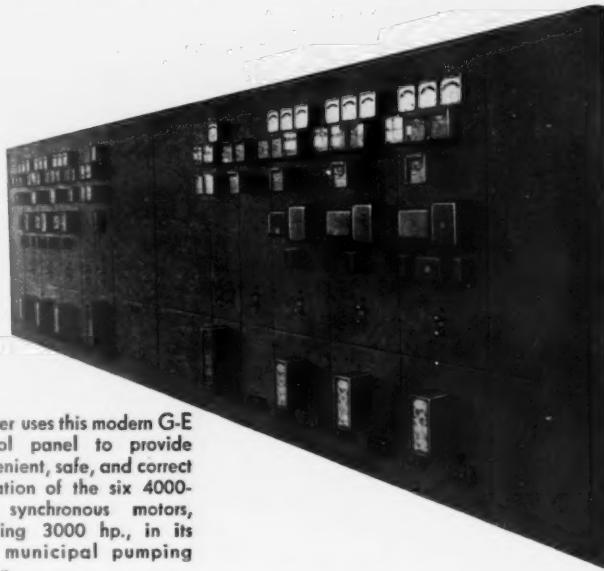
FOR assurance of correct operation, equip your synchronous motors with G-E controllers. They will automatically provide full protection to the motors and at the same time prevent unnecessary shutdowns.

Simply press a button, in the magnetic type, or throw a hand lever, in the semimagnetic type, and G-E synchronous-motor controllers do the rest. They protect motors from injurious heating during every operating condition, including starting, running, stalling, overload, low voltage, excitation failure, and operation at subsynchronous speeds.

They also prevent all unnecessary shutdowns. For example, when a momentary voltage dip or load peak pulls the motor out of step, an entirely automatic resynchronizing process begins at once to restore normal operation.

General Electric offers a complete line of magnetic and semi-magnetic controllers suitable for synchronous motors of any horsepower, voltage, and frequency rating. Either reduced-voltage or full-voltage starting may be obtained.

For further particulars, write to the nearest G-E office, or to General Electric, Dept. 6H-201, Schenectady, N. Y.



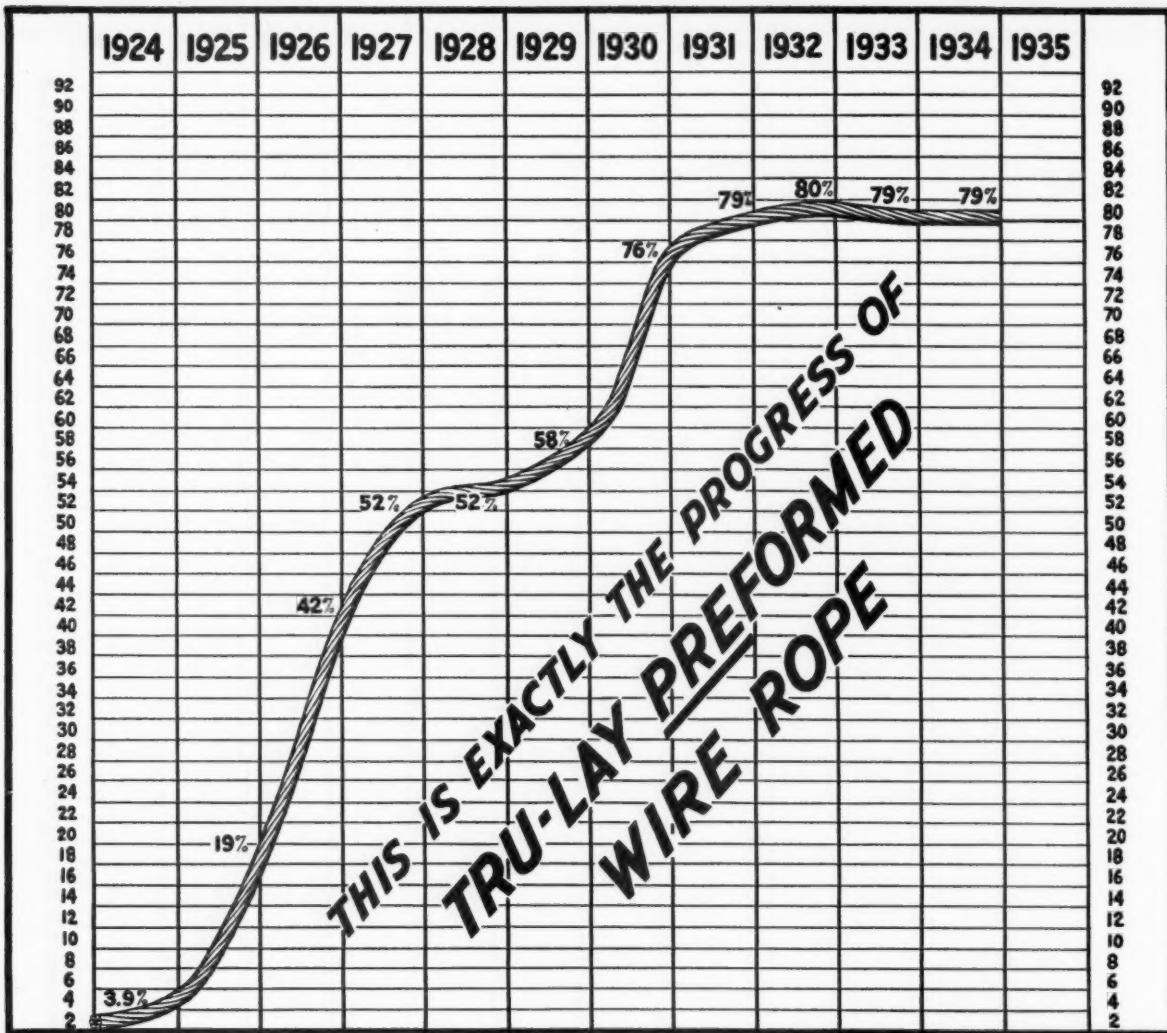
Denver uses this modern G-E control panel to provide convenient, safe, and correct operation of the six 4000-volt synchronous motors, totalling 3000 hp., in its new municipal pumping station

080-23

GENERAL  ELECTRIC

MARCH, 1935

11



TRU-LAY Preformed Wire Rope was introduced by the American Cable Company, Inc., in 1924. For many years we had made a high grade non-preformed rope and we still make it under brand name of "Crescent." In fact, non-preformed was the only type made and sold by any manufacturer from the production of the first wire rope in 1846 to the year 1924 when the American Cable Company perfected and introduced Tru-Lay Preformed.

During 1924, the first introductory year of Preformed Wire Rope, "Tru-Lay" accounted for

3.9 per cent of American Cable Company's entire sales volume.

Once in actual service, "Tru-Lay" proved itself so far superior to the non-preformed type of wire rope that by 1925 it commanded 19 per cent of the American Cable Company's volume. In 1926, Tru-Lay jumped to 42% of the total; then in 1927 to 52%; 1928—52%; 1929—58%; 1930—76%; 1931—79%. Since then it has been hovering around that high percentage.

Gentlemen, those figures prove that "Tru-Lay Preformed" gives longer service.

We will gladly send you either literature
or a representative, without obligation

AMERICAN CABLE COMPANY, Inc.

Wilkes-Barre, Pennsylvania

District Offices: Atlanta Chicago Denver Detroit New York
Philadelphia Pittsburgh Houston San Francisco



TRU-LAY *Preformed** Wire Rope

* PREFORMING IS A PATENTED MANUFACTURING PROCESS APPLICABLE TO ANY TYPE, GRADE, CONSTRUCTION AND LAY OF WIRE ROPE

59 VARIETIES

DURING the Middle Ages necromancers were imprisoned, tortured, and executed. The astrologer was treated somewhat better. During all ages those predictions which have misled humanity to its very great disadvantage were regarded as mischievous and cruel.

March's Thesaurus lists 59 different kinds of divinations or forms of prophecy. It remains for the present age to undertake to convince the public that the nation can be clothed more completely by the destruction of cotton and the limitation upon further production; that the destruction of wheat and the limitation upon production make easier the feeding of a hungry populace; that a limitation upon production by shortening hours of labor will increase the comforts which may be enjoyed by the human family, and that a scarcity in the market will make the necessities of life cheaper to the consumer and enable the salaried worker to buy more with his wages.

It is a well recognized fact that improved methods of production have largely increased the possibility of full markets, and statistics prove that the difference between 5 percent and 10 percent of our entire production shipped into foreign markets marks the difference between stagnation and great prosperity.

For many years it was the boast of American economists that trade followed the flag. Our more practical business men recognize that efficiency of production and cheap goods are necessary in order to enable us to undersell foreign competitors in their own market.

Our earlier statesmen quickly recognized that home industry was essential to prosperity and that the sale of manufactured articles, raw material plus labor, in foreign markets was altogether more profitable to the nation than the sale of raw material.

In the early days the great staple production of the South, cotton, because of a lack of the possibility of domestic manufacture, found its great market in foreign manufacturing centers, which in turn sold their manufactured products in our own markets. Notwithstanding this great disadvantage to our own consumers, the South has continued to look to foreign markets for the sale of a great part of its cotton production.

The increased price of cotton goods, growing out of war conditions, led to increased production in every country where the climate and soil are suitable for cotton production. This country finds itself selling less and less cotton abroad to the very great disadvantage of the Southern States.

The sale of manufactured cotton goods abroad has, in like manner, been decreased largely because of the increased cost of domestic production. Foreign markets are being supplied by rapidly developing cotton manufacturing enterprises abroad.

It is possible for other nations which have heretofore consumed our manufactured cotton goods to buy more cheaply in other markets. Until costs of production are increased in these foreign countries, the trend toward entire elimination of our products in those markets marches steadily on.

Increasing cost of production by shorter hours and higher wages is the sure road to the destruction of foreign markets.

The same increasing cost places a burden upon the American consumer and opens our markets more widely to foreign production. Increasing costs of domestic production makes competition with foreign goods more difficult and increasing costs in our domestic markets open up those markets to foreign production.

In aid of that commanding and very commendable desire of our present Government to restore prosperity, we are increasing our cost of production under the requirements of the National Recovery Act and kindred legislation.

Now we are proposing to shorten our hours of service to 30 hours per week and to very greatly reduce protective tariffs, which are designed to correct the inequalities between cost of production here and abroad as measured by the difference in labor costs.

The genius of the inventor of the perpetual motion, surely, will be required to turn scarcity into plenty by limiting production; to increase prosperity by opening our markets to imported goods and to make the dollar of the wage earner buy more of the necessities of life in a scarce market than in one which is well supplied. March's 59 varieties of soothsayers needs be largely increased to make room for those who propose to make water run uphill; destroy the law of gravity and successfully to ignore the law of supply and demand.

Shorter working hours mean lesser production. Less production means a higher price level. Higher price levels mean a reduced value of money. No more scientific scheme has yet been evolved to reduce the wages of workers than the raising of price levels of the necessities of life. In the end there must be an approximate relation between wages and price levels, because 90 percent of the cost of material is paid out in wages.

In 1929, workers in domestic industry were employed an average of 48.4 hours weekly and, with the exception of less than 5 percent increase in stocks of merchandise on hand at end of year, all goods produced were consumed. A 30-hour week would have produced five-eighths of the goods required for consumption, created a dangerous scarcity in our markets, raised prices to forbidding levels, and reduced the value of wages proportionately.

The day may come when a 30-hour week is feasible, but at this time it spells disaster and want and the substitution of poverty for plenty.



The MINING CONGRESS JOURNAL



NUMBER 3
VOLUME 21

MARCH
1935

A Journal for the entire mining industry published by The American Mining Congress

Legislation For Coal



seems to be decidedly at variance.

On March 31 all agreements covering wages and working conditions between operators and miners expires. The question of permanent specific legislation for regulation of the industry is being carefully considered. It is debatable as to whether the industry is ready for permanent legislation. The other alternative is the possible extension of the coal code under NIRA for a two-year period—a thing which undoubtedly provides regulation of a temporary nature.

The industry generally has approved the code. Even the most ardent exponents of "rugged individualism" admit that the code has been beneficial and that the industry is emerging from at least some of its chaos. Strong opposition from within and without the industry has appeared against specific legislation in the form of the Guffey bill. At the same time there is an increasing realization of the ever-diminishing lack of compliance enforcement, which tends to make the code ineffective.

The President has asked for a continuance of NIRA. Presumably, an attractive new dress is to be advocated for adoption prior to June 16. Whether or not that dress will be of a pattern which will appeal to coal is a question unanswerable at the moment.

The coal industry may well examine the question, "What will happen if there is no specific legislation for coal, and if NIRA's new dress does not materialize or perhaps shall be of a complicated pattern?" In reaching this decision, there has never been so important a need to submerge consideration of small or temporary individual advantages and constructively think for the good of the coal industry as a whole.

Rehabilitation vs. the Dole



No policy of the administration will receive warmer approval and no other seems more likely to accomplish practical results than the proposal to rehabilitate industry as a substitute for the dole. From three to four-fifths of our working population has been more or less continuously employed, and yet we are spending approximately 10 billion dollars annually to provide relief for the 10 millions of unemployed. The return of these unemployed to the regular channels of industry is greatly hampered by the increased wage levels made essential by the NRA. Such requirements may have a proper place in our economic system when business is normal and a market is available for the usual production of industry. But when production is already in excess of consumptive demand and the surplus of goods thus produced are glutting our

markets, there is little hope that industry can absorb this additional labor to produce high-cost goods to be sold in a low-cost or a depressed market. The day is very likely to come when wholesale attempts of government to direct and control industrial operation will be regarded as a monumental act of imbecility. There is no hope that these idle men can be absorbed by industry so long as relief benefits are in excess of the usual wage levels in the several communities.

Business Surveillance



An IMPORTANT Administration official recently was heard to remark that the American people have had about as many rights taken away from them as they are willing to tolerate. Those who agree should read with interest Senate Bill 944, which gives a power to the Federal Trade Commission that would certainly abrogate many rights.

The bill consists of 14 lines, amends the Federal Trade Commission Act by authorizing and directing it to "prevent persons, partnerships and corporations from using unfair methods of competition in or affecting commerce; and unfair or deceptive acts and practices in or affecting commerce."

The Commission now performs valuable service in the suppression and prevention of rank frauds. It deals wholly with *interstate* commerce—not commerce per se. Congress has jurisdiction over commerce between states but not within states; it has jurisdiction over merchandise that eventually enters into commerce. The amendment proposed would give it the right to assume the role of national detective and inquire into the affairs of "persons, partnerships or corporations" under the assumption that their acts affect commerce. If such power is granted, who shall set the standard of what is deception? Every honest man decries fraudulent practices, yet it is possible to have such a divergence of opinion as to what constitutes standards as to make this proposed national Paul Pry a menace.

Modernizing Industry



SUBSTANTIAL evidence is available to prove that industry is distinctly on a modernization trend and is making inquiries concerning, and in many instances, placing orders

for equipment to bring production costs down and more efficiently equip properties.

The trend is very evident in the mining industries, particularly coal, which had a reasonably satisfactory year in 1934. Sales offices report that second-hand material, which has been a drug on the market when plants liquidated, is pretty well cleaned up, and companies are finding it advantageous to buy new equipment rather

than eull what little second-hand machinery there is available.

Several important mining machinery firms have stated that inquiries at this time are heavier than for many months and in many instances heavier than in 1930.

There is no question of the necessity for rehabilitation of mine and equipment. Mines of necessity have neglected purchases and, with the increased operating costs due to the shorter work-day and code requirements, they are compelled to investigate new efficiency methods and equipment.

The May exposition of The American Mining Congress, with its record advance sale of space, bears out the above statements. That organization reports practically a sell-out in six weeks' time.

The Gold Decision

THE SUPREME COURT of the United States, after weeks of deliberation, rendered a five-to-four verdict upholding the Administration's view in the gold cases which it had

under consideration. In view of this divided verdict, it is not to be wondered that public opinion is similarly divided. It is to be noted that those who radically disagree with the court's conclusion do so because of a belief that it means a repudiation of obligations entered into which the holders of gold bonds had a right to expect would be filled according to the letter.

Many of these are ready to join with those who support the conclusion of the court on grounds of expediency and readily admit that at this time a contrary decision would have worked great disadvantage to the commercial affairs of the nation. The most interesting criticism of the decision was that voiced by the minority members of the court.

However we may question the conclusion of the court, as American citizens we are bound by its decision and should congratulate ourselves that our government structure contains elements which make for perpetuity through majority control. We may quote the last words of a distinguished ex-President of the United States, "God reigns and the Government at Washington still lives."

Labor's Struggles

FEW OF us are so far removed from labor's problems as to have no sympathy for its aims and struggles. Most of us labor, if not with our hands, at least with our minds. All

of those who serve for pay, labor.

It is not with labor's ambitions and struggles that the vast majority of us quarrel. It is with its method of climbing the ladder. We cannot afford to be pulled down to a level of mediocracy because of the misguided zeal of the few to raise the many. And that is what happens when a minority attempts to legislate for a majority.

The American Federation of Labor and similar labor organizations have been rampant for several years, and particularly the past two years, for the national adoption of an arbitrary six-hour work day. At least two Congresses, including the present, have spent endless hours listening to industry and labor tell the story of what the proposal will do for and against them.

There are millions of workers in this country; the Bureau of the Census reports them as some thirty mil-

lions. Of this vast horde 76.7 percent are unorganized; 12.8 percent are members of the American Federation of Labor; 8 percent are affiliated with plant unions and works councils. According to a recent dependable survey, 23.3 percent of all workers in this country are affiliated with some "organized" plan.

A change from the 40 to the 30-hour week, without a change in wage, would increase production costs 33 1/3 percent. Granted that this increase might be passed on to the consumer, it would immediately bring a tremendous increase in the cost of living, and the worker would soon find that his weekly pay did not buy as much as formerly and his standard of living materially reduced.

We should not lose sight of the fact that prosperity cannot be attained by the simple expedient of increasing costs. Wages come from production, and production must depend upon earnings. The 6-hour bill may easily result, if enacted, in less employment. It is even possible that it might kill many industries that now give promise of prosperity and increased employment at wages that are consonant with the American standard of living.

Friends of labor will urge the great 76 percent of the unaffiliated to look into the proposals of the less than 16 percent of organized workers who are sponsoring this legislation.

On Distributing Wealth

NECESSITY is said to be the mother of the invention. The emergency of depression has developed many and varied plans for the annihilation of depression and the return of prosperity.

Among the more foolish of those which have received national attention are the plans of Mr. Townsend to scatter the wealth of the nation by a payment of a \$200 monthly pension to all persons over the age of 60, and the less fantastic but equally foolish plan of Senator Long to scatter the wealth by taking from the rich and giving to the poor. He advocates this because the wealth of the nation is practically 300 billion dollars and the greater part of it is owned and controlled by a very small percentage of the total number of people in the country.

If this wealth were liquid and capable of division, the plan would not be quite so fantastic. When it is considered that nine-tenths of this wealth consists of buildings, plants, and machinery and its use made entirely impossible if divided into parts, the impossibility of carrying out the plan seems evident. These plants can serve but one purpose—the production of goods. So far as the whole people are concerned, it matters not whether he who designed this machinery continues to operate it or whether some other man of equal knowledge of business shall take it over.

What does matter is that it shall be so operated so as to produce the largest amount of goods possible in order that the comforts of life may be more uniformly distributed among the great mass of people.

In ancient times the laws "of the Medes and the Persians" were regarded as the unchangeable rule of conduct for the human race. These laws have long been abandoned. But the law of gravitation existed before and since. The law of supply and demand was then, as well as now, recognized by all intelligent people and in the long run has controlled the activities of all peoples.

THE ECONOMIC IMPORTANCE

ALTHOUGH the United States lacks a few of the essential minerals, no country contains a greater variety and quantity. As much as two-fifths of the total value of our basic products in a year is credited to minerals. We could not exist without them and the manufactured products therefrom. Employment is given in busy years to approximately a million men and, without considering manufacturers, several million others depend on the mining and treatment of minerals.

A 4,000-word statement of T. A. Walters, first assistant secretary in the Department of the Interior, entitled "The Significance of the Bureau of Mines and the Mineral Industry," was released to the press on December 30, 1934. The first paragraph may be quoted:

Although the United States produces more than a hundred important minerals, whose annual output is valued at from four to seven billions of dollars, the average citizen probably has but a faint idea of the tremendous signifi-

cance of the mineral industries, or of the great extent to which his daily comfort and welfare—his very existence even—depend on the essential minerals which the legions of miners wrest from the underground depths.

This should indicate that mining is not a "game" or a stock business, but a vital factor in our lives. It does not stop at mining, for after an ore has been mined it must be skillfully treated for the extraction of its metal contents.

Although the mineral industry is our source of raw metallic and non-metallic materials, it is also an extensive purchaser of commodities needed in its operations. This buying averages \$350,000,000 a year, plus the many purchases made by business concerns and individuals in communities depending on mineral production.

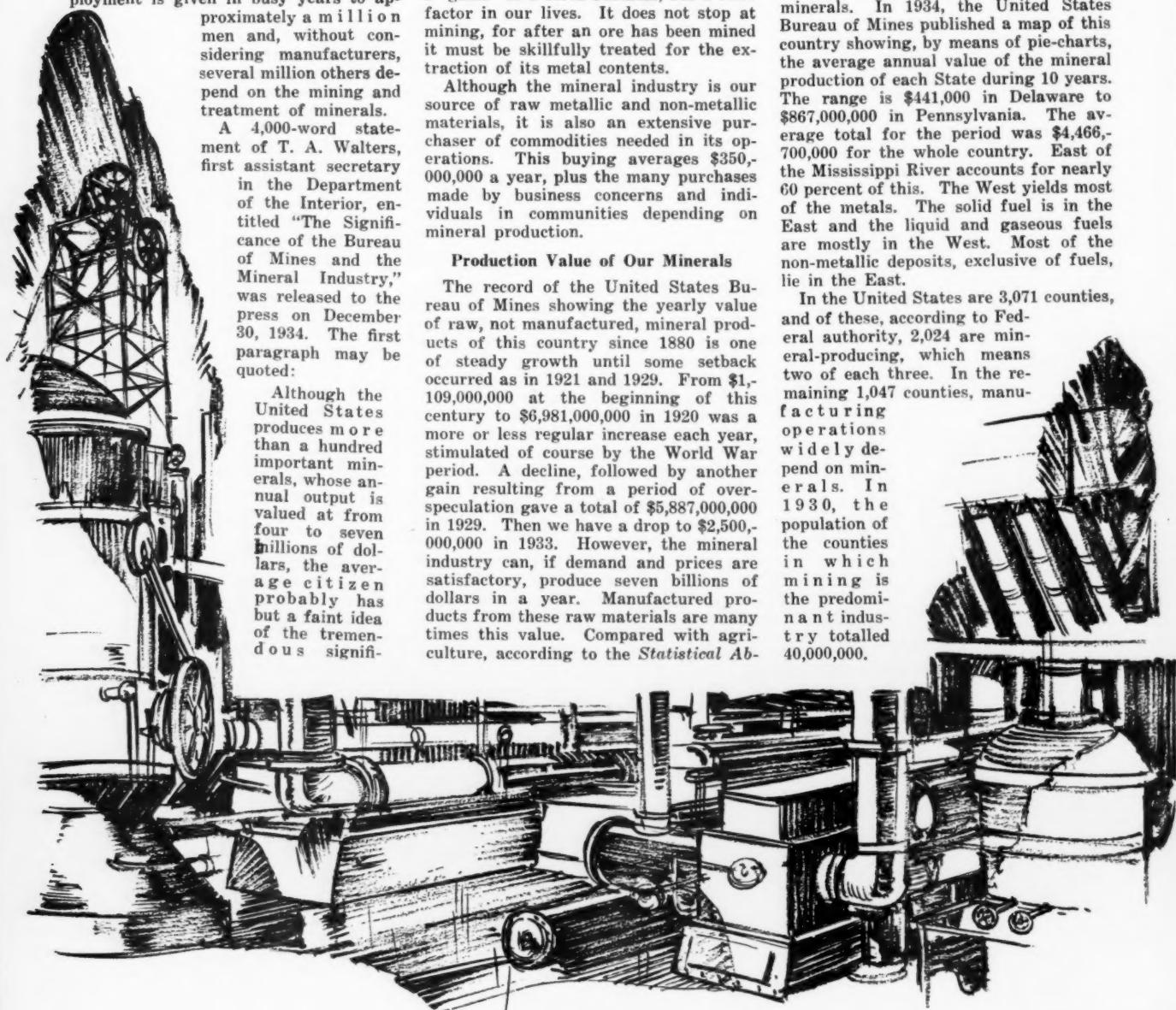
Production Value of Our Minerals

The record of the United States Bureau of Mines showing the yearly value of raw, not manufactured, mineral products of this country since 1880 is one of steady growth until some setback occurred as in 1921 and 1929. From \$1,109,000,000 at the beginning of this century to \$6,981,000,000 in 1920 was a more or less regular increase each year, stimulated of course by the World War period. A decline, followed by another gain resulting from a period of over-speculation gave a total of \$5,887,000,000 in 1929. Then we have a drop to \$2,500,000,000 in 1933. However, the mineral industry can, if demand and prices are satisfactory, produce seven billions of dollars in a year. Manufactured products from these raw materials are many times this value. Compared with agriculture, according to the *Statistical Abstract of the United States, 1934*, Department of Commerce, the estimated gross income from farm production was \$11,941,000,000 in 1929 and \$5,985,000,000 in 1933.

The States and Their Minerals

Every State in the Union produces minerals. In 1934, the United States Bureau of Mines published a map of this country showing, by means of pie-charts, the average annual value of the mineral production of each State during 10 years. The range is \$441,000 in Delaware to \$867,000,000 in Pennsylvania. The average total for the period was \$4,466,700,000 for the whole country. East of the Mississippi River accounts for nearly 60 percent of this. The West yields most of the metals. The solid fuel is in the East and the liquid and gaseous fuels are mostly in the West. Most of the non-metallic deposits, exclusive of fuels, lie in the East.

In the United States are 3,071 counties, and of these, according to Federal authority, 2,024 are mineral-producing, which means two of each three. In the remaining 1,047 counties, manufacturing operations widely depend on minerals. In 1930, the population of the counties in which mining is the predominant industry totalled 40,000,000.



OF THE MINERAL INDUSTRY

By M. W. Von BERNEWITZ

Rather interesting is the fact that certain States, and only small areas therein, contain ore deposits that are either not workable in other States or are of lesser importance than the principal producing State. For example—anthracite in Pennsylvania; bauxite, the ore of aluminum, in Arkansas; chromite, in California; copper in Arizona, Utah, Montana, Michigan; gold in California and South Dakota; helium gas in Texas; iron ore in Minnesota and Alabama; lead in Missouri and Idaho; lignite in North Dakota and Texas; magnesite in California and Washington; mercury in California and Texas; oil-shale in Colorado, Utah, and Kentucky; phosphates in Florida, Tennessee, and Idaho; potash in New Mexico, Texas, and California; sulphur in Texas and Louisiana; and zinc in Oklahoma and New Jersey. Indiana rather excels in limestone and several eastern States in granite, marble, and slate.

Unfortunately, for our self-reliance, we lack natural resources of certain minerals such as platinum, tin and nickel, these having to be imported, yet from scrap and secondary sources we have a fair circulating tonnage or reserve. The tin we use may come from Bolivia, the Netherlands, Indies, or Malaya. The nickel and platinum can all come from our northern neigh-

bor, Canada. This country also has deposits of antimony, asbestos, chromite, manganese, mica and tungsten.

The estimated emergency needs of minerals for two years are 1,000,000 tons of 50 percent ferro-manganese ore, 300,000 tons of 50 percent chromite, 60,000 tons of metallic tin, 10,000 tons of 48 percent tungsten ore, 35,000 tons of antimony, 40,000 tons of nickel, 3,000 tons of mica sheets and splittings, and 25,000 flasks (76 pounds each) of mercury.

The United States Bureau of Mines lists the mineral products and the States they come from as shown herewith. The order of importance of the States in production and of the chief minerals varies, as does the rank of the minerals in the States listed.

Mineral Taxation and Taxes Paid

The mineral industry is taxed by local, County, State, and Federal Governments. The heaviest burden is imposed by the three first listed, being several times that paid to the Federal Government which, in 1929, received \$44,318,798 as income tax, according to *Statistics of Income for 1929*, issued by the United States Treasury Department in 1931. To carry the analysis into the manufacturing field, metals and metal products paid \$236,493,687, during the same year. Agriculture paid \$6,783,059, say one-sixth of the tax paid by mining and quarrying. By 1932, of course, these totals had shrunk to several times less. The report cited shows that many properties had no net income—7,291 of them in 1929, compared with 5,211 that had a net income; 5,759 corporations were inactive.

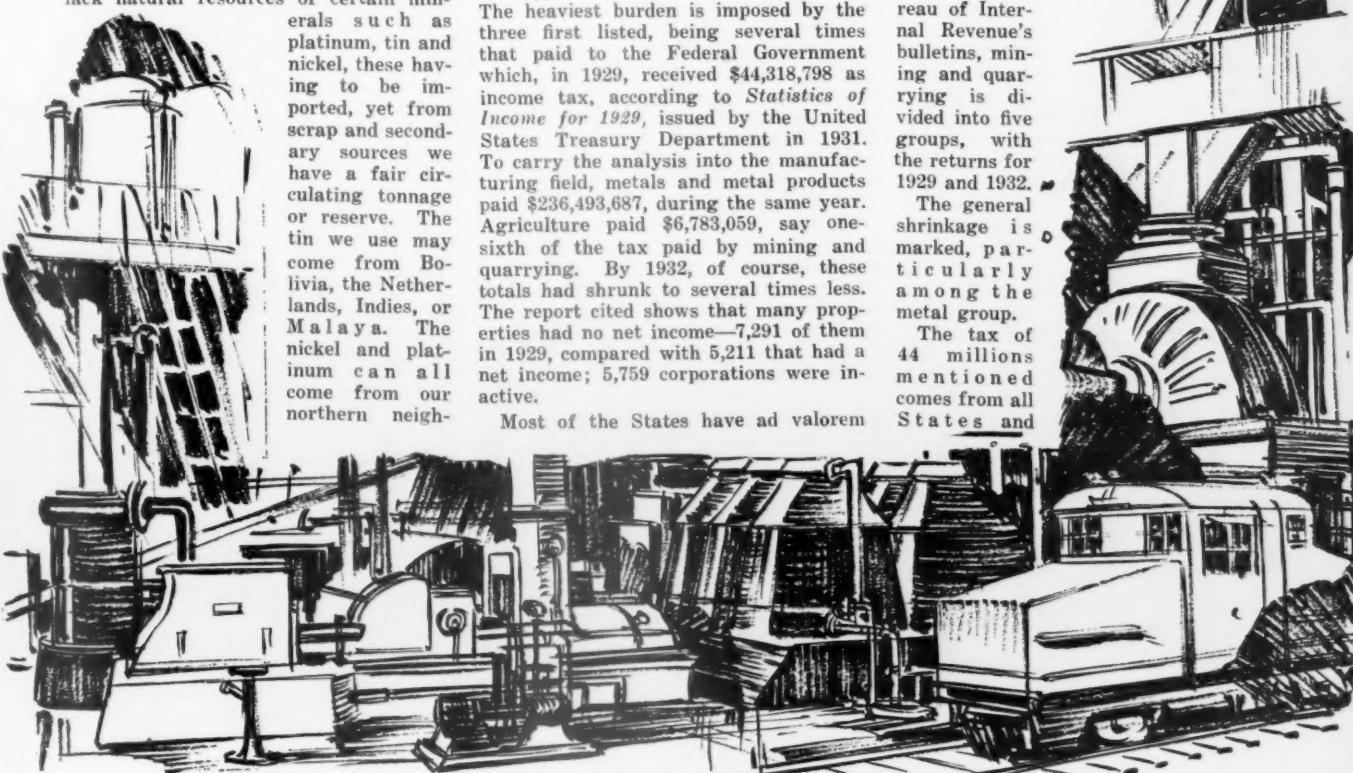
Most of the States have ad valorem

taxes, both on active mineral properties and on mineral reserves. The reserves are taxed annually for indefinitely long periods before coming into production. In some States the ad valorem tax is based on a larger proportion of true value than for other classes of property. In addition there is, in some jurisdictions, a multiplying group of special taxes on minerals, called "tonnage taxes," "severance taxes," "occupation taxes," and "royalty taxes." There are other special taxes on smelting, refining, and distribution. Some of the States have corporate income taxes. It is often asserted that the cumulative effect of these measures is to burden minerals with a load of taxation heavier than other classes of property, in certain cases so heavy as to approach confiscation.

In the Bureau of Internal Revenue's bulletins, mining and quarrying is divided into five groups, with the returns for 1929 and 1932.

The general shrinkage is marked, particularly among the metal group.

The tax of 44 millions mentioned comes from all States and



THE ECONOMIC IMPORTANCE OF MINERALS

Minerals and States			
Mineral	Chief States	Mineral	Chief States
Aluminum	N. Y., Tenn., N. C.	Manganiferous zinc residuum	N. J.
Antimonial lead	Not separable by states.	Marl:	
Arsenious oxide	Mont., Utah.	Calcareous	Calif., Va., W. Va., N. C.
Asbestos	Vt., Ariz., Ga., Md.	Greensand	N. J.
Asphalt:		Mercury	Calif., Nev., Oreg., Tex.
Native	Ky., Tex., Utah, Okla.	Mica	N. C., N. H., N. Mex., S. Dak.
Oil	Not separable by states.	Scrap	N. C., N. Mex., N. H., S. Dak.
Barite (crude)	Mo., Ga., Calif., Tenn.	Sheet	N. C., N. H., Ga., Conn.
Bauxite	Ark., Ga., Ala.	Micaceous minerals	N. C., Ga., Mont.
Bismuth	Not separable by states.	Millstones	N. Y., Va., N. C., N. H.
Borates	Calif.	Mineral paints, zinc and lead pigments	Pa., Ohio, Ind., Ill.
Briquets, fuel	Wis., Pa., W. Va., Oreg.	Molybdenum	Colo., N. Mex.
Bromine	Mich., Calif., W. Va., Ohio.	Natural gas	Tex., Okla., Calif., La.
Cadmium (metal and com- pounds)	Not separable by state.	Natural gasoline	Calif., Okla., Tex., La.
Calcium-magnesium chloride	Mich., Calif., W. Va., Ohio.	Nickel	Not separable by states.
Cement	Pa., Mich., N. Y., Calif.	Oilstones, etc.	Vt., Ohio, Ark., Ind.
Chats	Mo., Okla., Kans.	Pebbles for grinding	Minn., Calif.
Chromite	Calif.	Petroleum	Tex., Calif., Okla., Kans.
Clay products	Ohio, Pa., N. J., Ill.	Phosphate rock	Fla., Tenn., Idaho, Mont.
Clay, raw	Pa., Calif., Ohio, Mo.	Platinum and allied metals	Alaska, Calif., Oreg.
Coal:		Potassium salts	Calif., Md., Nev.
Bituminous	Pa., W. Va., Ill., Ky.	Pumice	Kans., Calif., Nebr., Ariz.
Anthracite	Pa.	Pyrites	Tenn., Va., Calif., N. Y.
Coke	Pa., Ohio, Ind., Ala.	Salt	Mich., N. Y., Ohio, Kans.
Columbite	S. Dak., N. Mex.	Sand and gravel	N. Y., Ill., Ohio, Calif.
Copper	Ariz., Mont., Utah, Mich.	Sand-lime brick	Mich., N. Y., N. J., Mass.
Diatomite and tripoli	Calif., Ill., Mo., Okla.	Selenium	Not separable by states.
Emery	N. Y.	Silica (quartz)	Wis., N. C., Calif., Md.
Feldspar (crude)	N. C., Me., N. H., S. Dak.	Silica sand and sandstone (finely ground)	Ill., N. J., W. Va., Pa.
Ferro-alloys	Pa., N. Y., Ohio, Iowa.	Silver	Utah, Idaho, Mont., Ariz.
Flint lining for tube mills	Minn.	Slate	Pa., Vt., Me., Va.
Fluorspar	Ill., Ky., Colo., N. Mex.	Sodium salts (other than NaCl) from nat. sources	Calif., Ariz., Wyo., Nev.
Fuller's earth	Ga., Fla., Tex., Ill.	Stone	Pa., Ohio, N. Y., Calif.
Garnet, abrasive	N. Y., N. H.	Sulphur	Tex.
Gold	Calif., Alaska, S. Dak., Colo.	Sulphuric acid from copper and zinc smelters	Tenn., Ill., Pa., Mont.
Graphite:		Talc and soapstone	N. Y., Vt., Va., Calif.
Amorphous	R. I., Nev., Mich.	Tellurium	Not separable by states.
Crystalline	Ala.	Tin	Alaska, N. C., S. Dak.
Grindstones and pulpstones	Ohio, W. Va., Mich., Ill.	Titanium ore:	
Gypsum	N. Y., Mich., Iowa, Tex.	Ilmenite	Va.
Iron ore	Minn., Mich., Ala., Wis.	Rutile	Va.
Iron, pig	Pa., Ohio, Ind., Ill.	Tungsten ore	Nev., Calif., Colo., Mont.
Lead	Mo., Idaho, Utah, Okla.	Uranium and vanadium ores	Colo., Ariz., Utah.
Lime	Ohio, Pa., Mo., W. Va.	Zinc	Okla., N. J., Kans., Utah.
Lithium minerals	S. Dak., N. Mex., Calif.		
Magnesite	Wash., Calif.		
Magnesium	Mich.		
Magnesium salts (nat.)	Mich., Calif.		
Manganese ore	Mont., Ga., Va., Ark.		
Manganiferous ore	Minn., Colo., N. Mex., Ark.		

States and Minerals			
State	Products	State	Products
Alabama	Coal, iron ore, cement, clay products.	Nevada	Copper, silver, gold, zinc.
Alaska	Copper, gold, coal, silver.	New Hampshire	Stone, clay products, sand, gravel, feldspar.
Arizona	Copper, gold, silver, stone.	New Jersey	Clay products, zinc, cement, sand, gravel.
Arkansas	Petroleum, coal, natural gas, bauxite.	New Mexico	Coal, copper, zinc, petroleum.
California	Petroleum, natural gas, clay products.	New York	Clay products, cement, stone, sand, gravel.
Colorado	Coal, gold, clay products, zinc.	North Carolina	Stone, clay products, feldspar, copper.
Connecticut	Clay products, stone, lime, sand and gravel.	North Dakota	Coal, clay products, sand and gravel, natural gas.
Delaware	Clay products, stone, sand and gravel.	Ohio	Clay products, coal, natural gas, stone.
Dist. of Col.	Sand and gravel, clay products, sand-lime.	Oklahoma	Petroleum, zinc, natural gas, gasoline.
Florida	Phosphate rock, stone, Fuller's earth.	Oregon	Cement, stone, sand, gravel, clay products.
Georgia	Clay products, stone, cement, Fuller's earth.	Pennsylvania	Coal, cement, clay products, natural gas.
Idaho	Lead, silver, zinc, stone.	Rhode Island	Stone, clay products, lime, sand and gravel.
Illinois	Coal, clay products, petroleum, cement.	South Carolina	Stone, clay products, sand and gravel, barite.
Indiana	Coal, cement, stone, clay products.	South Dakota	Gold, stone, sand and gravel, cement.
Iowa	Coal, cement, clay products, gypsum.	Tennessee	Coal, cement, stone, phosphate rock.
Kansas	Petroleum, zinc, natural gas, cement.	Texas	Petroleum, sulphur, natural gas, natural gasoline.
Kentucky	Coal, petroleum, clay products, natural gas.	Utah	Copper, silver, lead, coal.
Louisiana	Petroleum, natural gas, sand, gravel.	Vermont	Stone, slate, lime, talc.
Maine	Stone, lime, cement, sand and gravel.	Virginia	Coal, clay products, stone, zinc.
Maryland	Coal, clay, cement, sand, gravel.	Washington	Coal, cement, clay products, sand, gravel.
Massachusetts	Stone, clay products, lime, sand and gravel.	West Virginia	Coal, natural gas, petroleum, clay products.
Michigan	Iron ore, copper, cement, salt.	Wisconsin	Stone, sand and gravel, iron ore, clay products.
Minnesota	Iron ore, stone, cement, sand and gravel.	Wyoming	Petroleum, coal, natural gas, gasoline.
Mississippi	Sand, gravel, clay products, gas, stone.		
Missouri	Lead, clay products, cement, coal.		
Montana	Copper, coal, petroleum, natural gas.		
Nebraska	Cement, clay products, sand and gravel.		

THE ECONOMIC IMPORTANCE OF MINERALS

Alaska. In 1926 it reached 57 millions. The range in 1929, excluding States grouped in the report cited, was \$2,076 in Mississippi to \$17,526,753 in New York, the latter being so high because so many mining companies registered there. California paid \$2,832,218; Illinois, \$1,280,087; Maryland, \$342,039; Ohio, \$2,868,449; Oklahoma, \$3,610,793; Pennsylvania, \$4,063,341; West Virginia, \$798,925; and Wyoming, \$38,014.

The Federal Government's Evaluation Of The Mineral Industry

The great disparity between Federal appropriations for the mineral industry and for agriculture is frequently discussed. For the current fiscal year, the former—including the Bureau of Mines and Geological Survey—gets \$2,511,000; for agriculture, exclusive of highways, the sum is \$49,000,000. The ratio of production by these two basic industries to the appropriations is considerably out of line. The Bureau of Mines with \$1,198,000 gets little more than the Biological Survey of the Department of Agriculture and less than the Fisheries Bureau of the Department of Commerce!

Commerce in Minerals and Metals

Imports and exports of minerals and metals and manufactures thereof constitute a considerable proportion of United States foreign commerce. During the periods 1921-1925 and 1926-1930, according to the *Statistical Abstract of the United States, 1934*, imports averaged \$3,450,000,000 and \$5,430,000,000 per year, while exports averaged \$4,390,000,000 and \$4,770,000,000. For these same periods, commerce in products of the mineral industry are shown on this page.

The yearly average, therefore, ranges from \$473,367,000 to \$604,313,000 as imports and from \$997,840,000 to \$1,170,729,000 as exports, and the total trade in the products of the mineral industry has been \$1,471,000,000 to \$1,775,000,000 a year, against commerce of all kinds of \$7,840,000,000 to \$10,220,000,000 in those years, equivalent to about 17 percent. The exports of copper, lead, petroleum, steel, and zinc and their products, involve large quantities.

Group	Income Tax Paid by Mining and Quarrying Companies			
	1929		1932	
	Returns	Income tax	Returns	Income tax
Metals—Copper, gold, iron, lead, mercury, silver, zinc.....	295	\$20,053,890	80	\$879,000
Coal:				
Anthracite	62	1,339,793	32	206,000
Bituminous, lignite, peat.....	905	3,940,062	289	777,000
Petroleum and gas.....	1,850	10,437,571	1,102	2,831,000
Other minerals—Asbestos, clay, gemstones, granite, salt, and others.....	1,069	5,711,646	294	1,433,000
Not elsewhere specified—Lessors and holders	1,030	2,835,836	1,071	1,319,000
Total.....	5,211	\$44,318,798	2,868	\$7,445,000

Group	Foreign Trade in Minerals and Metals	
	Imports/year	Exports/year
Non-metallic:		
Coal and related fuels	\$230,110,000	\$582,352,000
Petroleum and products	for 1921-1925	for 1921-1925
Stone, sand, cement, lime	\$280,241,000	\$706,964,000
Glass and glass products	for 1926-1930	for 1926-1930
Clay and clay products		
Gemstones		
Other non-metallics		
Metals and manufactures, except machinery and vehicles:		
Iron ore and concentrates		
Iron and steel semi-manufactures	\$243,257,000	\$415,488,000
Steel-mill products	for 1921-1925	for 1921-1925
Iron and steel—advanced manufactures	\$334,072,000	\$463,765,000
Ferro-alloys	for 1926-1930	for 1926-1930
Non-ferrous metals, except precious		
Precious metals and ware (not bullion or coin)		

Labor in the Mineral Industry

It has been estimated that in a year of active industry, the mineral industry and the manufactures thereof employ 1,700,000 persons who average \$1,230 or more in wages per year. Salaried men are not included in this figure. Wage-earners during 1929, according to the Census, averaged 806,043 at 11,602 mines and quarries, and received \$1,340 each. The 48,035 salaried men averaged \$2,530 each. The United States Bureau of

Mines lists 654,000 at coal mines, 118,000 at metal mines, and 85,000 at quarries; also 22,000 at coke ovens and 47,000 at metallurgical plants, a total of 927,000.

Bulletin 573 of the Bureau of Labor Statistics, 1933, entitled *Wages and Hours of Labor in Metalliferous Mines, 1924 and 1931*, gives the figures following:

The study of 1924 covered 20 open-pit and 117 underground mines employing 38,196 men, and that of 1931 covered 22



A western town that derives much business from mining—part of Salt Lake City, looking east to the Wasatch Range

THE ECONOMIC IMPORTANCE OF MINERALS

Minerals Yearbook, 1934, summarizes the preliminary figures of mineral production as follows, some items without values, not affecting the total, being omitted:

Mineral Products of United States, 1933

Product	Unit	Quantity	Value
<i>Metallic</i>			
Aluminum	Pound	85,126,000	\$16,174,000
Antimonial lead	Short ton	17,805	.....
Antimony	" "	1,133	.....
Bauxite	Long ton	154,176	923,239
Cadmium	Pound	2,276,933	.....
Chromite	Long ton	843	11,585
Copper (sales value)	Pound	449,999,143	28,800,000
Ferro-alloys	Long ton	421,423	28,653,794
Gold	Troy ounce	2,556,246	65,337,648
Iron, pig	Long ton	14,353,197	213,347,583
Lead (sales value)	Short ton	259,616	19,212,000
Manganese ore (35% + manganese)	Long ton	18,558	452,173
Manganese ore (5 to 35% manganese)	" "	191,631	529,204
Mercury	Flask of 76 pounds	9,402	556,852
Nickel	Short ton	126	62,913
Platinum and group metals	Troy ounce	51,539	1,631,000
Silver	" "	23,002,629	8,050,920
Tin	Short ton	3	2,100
Tungsten concentrates	" "	895	514,234
Uranium and vanadium ores	" "	105	4,119
Zinc (sales value)	" "	306,010	25,705,000
Total metallic			\$411,300,000
<i>Non-metallic</i>			
Arsenious oxide	Short ton	11,797	\$636,132
Asbestos	" "	4,745	130,677
Asphalt	" "	313,135	1,705,310
Barite	" "	167,880	852,611
Borates	" "	188,047	3,436,377
Bromine	Pound	10,147,960	2,040,352
Calcium-magnesium chloride	Short ton	57,813	893,442
Cement	Barrel	64,056,000	83,965,000
Clay (raw)	Short ton	1,840,173	6,840,617
Coal:			
Anthracite	" "	49,399,000	213,400,000
Bituminous	" "	327,940,000	445,998,000
Coke	" "	27,555,375	.....
Diatomite and tripoli	" "	20,878	350,383
Emery	" "	1,056	12,283
Feldspar	Long ton	150,633	778,826
Fluorspar	Short ton	72,930	1,039,178
Fuller's earth	" "	251,158	2,315,974
Garnet (abrasive)	" "	2,794	224,717
Grindstones and pulpstones	" "	14,176	444,250
Gypsum	" "	1,335,192	11,927,478
Lime	" "	2,224,000	14,006,000
Magnesite	" "	108,187	840,000
Mica:			
Scrap	" "	8,751	98,159
Sheet	Found	364,540	53,179
Millstones			8,387
Natural gas	Cubic foot	1,480,000,000,000	375,000,000
Natural gasoline	Gallon	1,411,600,000	53,640,000
Oilstones	Short ton	587	96,597
Petroleum	Barrel	898,874,000	540,000,000
Phosphate rock	Long ton	2,490,312	7,872,362
Pigments (lead and zinc)	Short ton	129,355	13,193,627
Potassium salts (K-O)	" "	139,067	5,296,793
Pumice	" "	61,220	241,834
Pyrite	Long ton	284,311	769,942
Salt	Short ton	7,604,972	22,318,086
Sand:			
Glass	" "	1,820,000	.....
Molding, building, and gravel	" "	102,180,000	.....
Silica (quartz)	" "	11,153	71,048
Slate	" "	259,620	2,696,185
Stone	" "	76,000,000	87,400,000
Sulphur	Long ton	1,637,368	29,500,000
Sulphuric acid from smelters	Short ton	656,102	4,337,983
Talc and soapstone	" "	160,554	1,681,324
Total non-metallic			\$2,076,900,000

open-pit and 117 underground mines employing 32,195 men. Of the open-pit mines in 1931, three were in Alabama; sixteen in Minnesota; and one each in Nevada, New Mexico, and Utah. Of the deep mines, nine were in Arizona; eight each in California, Nevada, and Utah; ten in Colorado; four in Idaho; five each in Kansas, Montana, and New Mexico; sixteen in Michigan; thirteen each in Minnesota and Oklahoma; seven in Missouri; and one in South Dakota. Of the 139 mines in 1931, one metal only,—copper, gold, iron, manganese, lead, vanadium, or zinc,—was produced in each of 75 mines; two metals, as gold and silver, or lead and zinc, in 29 mines; three metals as copper, gold, and silver, or silver, lead, and copper, in 18 mines; four metals, as zinc, silver, manganese, and gold, in 11 mines; and five metals, as gold, silver, copper, lead, and zinc, in each of 6 mines. The depth of the 103 shaft mines ranged from 100 and less than 200 feet to 5,700 feet, and the average distance from the shaft bottom to the working face was less than 100 to between 8,000 and 9,000 feet. Some underground men worked part of their time on the surface. The findings of the investigation were as follows:

Western mixed-ores mines.—from 1924 to 1931, average full-time hours per week dropped from 53.8 to 50.7; average earnings per hour, however, increased from 59.9 cents to 60.8 cents, while full-time earnings per week decreased from \$32.23 to \$30.83.

Michigan copper mines.—There was a decrease from 1924 to 1931 in average full-time hours per week from 49.6 to 49.4, in earnings per hour from 49.8 cents to 44.3 cents, and in full-time earnings per week from \$24.70 to \$21.88.

Northern iron mines.—From 1924 to 1931, average full-time hours per week rose from 52.8 to 54.3; earnings per hour, however, dropped from 56.8 cents to 56.0 cents, but full-time earnings per week increased from \$29.99 to \$30.41.

Alabama iron mines.—From 1924 to 1931, there was a decrease in average full-time hours per week from 60.6 to 58.4, in average earnings per hour from 39.3 cents to 37.2 cents, and in full-time earnings per week from \$23.82 to \$21.72.

Tri-State lead and zinc mines.—There was a drop from 1924 to 1931, in average full-time hours per week from 48.6 to 48.2, in earnings per hour from 55.2 cents 47.7 cents, and in full-time earnings per week from \$26.83 to \$22.99.

Prospecting, Developing, Producing

To bring a mine to the producing and dividend stage requires much "dead" work, cash outlay, and often disappointment. The public knows little of this and complains after it has lost money in speculating in shares without getting competent and honest advice.

The development of any mine requires the services of skilled, practical

Consumption of Minerals and Metals in Motor Vehicles

Material	Quantity, tons	Percent of total annual output
Aluminum	10,000	23.5
Copper	64,000	15.4
Gasoline	13,621,727,000 (gallons)	85.0
Iron:		
Gray	397,250	9.3
Malleable	174,000	55.0
Lead	156,000	35.4
Lubricating oil	412,500,000 (gallons)	57.5
Nickel*	3,375	24.0
Steel	3,250,000	19.2
Tin*	7,200	11.1
Zinc	25,000	7.1

* Sales or deliveries in United States; no ore deposits here; all imported.

mining, geological, and mechanical engineers. They must understand the type of deposit they are opening and prepare the mine for a certain daily output, with reserves to fall back on, like a bank account, also the cost of mining. The amount of equipment needed and the cost thereof to develop a mine is realized by few laymen.

When a mine has been prepared for production, a treatment plant must be erected. Prior thereto, chemists and metallurgists determine the amenability of the ore to different processes, or, conversely, the suitability of the latter to the former. They must consider the cost of treatment. The running of a plant requires the constant attention of a metallurgist, chemists, assayers, electrical and mechanical engineers, and good workmen. A recovery of 90 to 97 percent of the mineral contents of an ore is aimed at and expected. During a busy year, as much as 130,000,000 tons of copper, gold, and silver, iron, lead, and zinc ores are treated by some means. Approximately a fifth of the present 25,000,000 tons of iron ore used is washed to rid it of impurities and a tenth of the coal mined is washed to improve its burning qualities.

Motor Vehicles and Metals

How many riders, users, and observers of the 21,000,000 or more passenger cars and 3,500,000 motor trucks in this country consider the metals that make up an automobile or truck? According to the National Automobile Chamber of Commerce, the automobile industry in 1933 was the largest consumer of steel in all forms, also of lead, nickel, gasoline, and lubricating oil, all originating as minerals. These and the other metallic minerals used may be tabulated as under:

In addition to the steel actually used in building motor vehicles, another 4½ percent was used in highway construction. A large quantity of asbestos is used in brake lining.

Increased demand for motor vehicles increases the production of minerals and metals, thus setting in motion operations all along the line, from mining to making the finished product; whereas a slackening of demand reverses these operations.

Opposed to this use of new metals are the scrap metals reclaimed from the 2,000,000 and more vehicles scrapped each year. These metals are refined and again find their way to the metal markets.

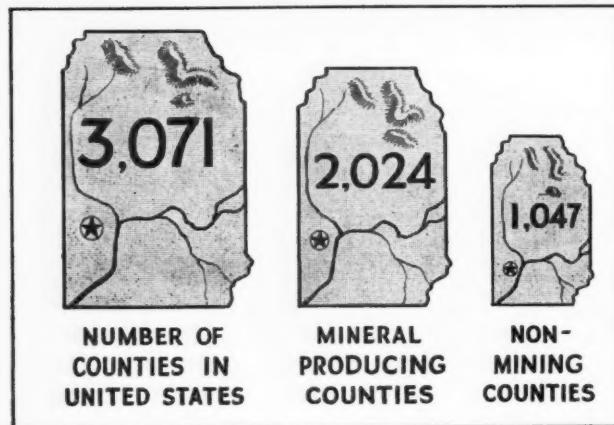
Accident Prevention in Mining and Other Industries

Although there have always been some sort of accident-prevention methods in mining and other industries, it was not until the "safety-first" movement became so prominent in mining and its related operations that it was seriously taken up by all industries. Individual safety is erratic; organized safety decreases accidents. Care in doing things should be a condition of employment; a careless man can and does cause much danger and trouble. The safeguarding and good lighting of walkways, working places, and machinery is most essential. Accident prevention is an operating problem and costs, yet saves, money. Thus, the mineral industry of the United States has been a big factor in spreading and instructing many or all other industries in how to work safely and comfortably. Back of this has been and is the insistent work of the Federal Bureau of Mines, which has instructed more than 800,000 men personally and distributed millions of copies of suitable publications.



The Familiar Churn Drill

THE ECONOMIC IMPORTANCE OF MINERALS



*Mineral and Non-Mineral
Producing Counties of
the United States.*

PERTINENT FACTS ON MINERALS

In all of its ramifications—mining, refining, processing, merchandising—approximately 25,000,000 people are dependent upon minerals for a livelihood.

There are 3,071 counties in the United States. 2,024 of them yield minerals. The 1930 population of these counties was 40,000,000 people.

Every state in the Union produces minerals to some extent.

Minerals are capable of producing in a single year seven billions of wealth.

Minerals pay better than 22% of the total Federal income. In 1929, 295 metal producers paid more than \$20,000,000 to the Federal government in taxes. Coal paid \$5,250,000. Petroleum paid \$10,500,000. All branches of the industry paid \$44,500,000. (These figures do not include taxes paid local, county and state governments).

In a year of reasonable prosperity minerals employ 1,700,000 wage earners, whose average annual wage is \$1,230. (No salaried employees included in this figure).

Purchases of equipment and supplies for the production of minerals approximate \$350,000,000 annually.

Minerals enter into practically every phase of our civilization, and furnish the raw material for an amazing proportion of industry. Among the industries by-product to minerals are: motion pictures, tableware, kitchen utensils, automobiles, batteries, railroad rails and coaches, wire, roofing and building materials, printing, chemicals, plumbing, ink, paints—in fact practically every phase of human endeavor and every phase of human existence, human necessity, comfort or luxury.

In five years (1924-1928), mineral producers paid almost six times as much as farmers in Federal taxes.



MAJOR METALLIC MINERALS

ALUMINUM, copper, gold, iron, lead, silver, and zinc are the major metallic minerals that we mine in the United States, and more or less detail of the operations in producing them follow:

ALUMINUM

Although the United States imports some bauxite, the ore of aluminum, we have a reserve of both high-grade and low-grade ores, and the latter some day will be utilized. In a year we produced 115,000 tons of the metal worth \$51,000,000, which is a half or more of the world total. Aluminum is extracted from its ore by chemical and electrical processes. Production of the virgin or new metal is made in few plants, but many foundries and mills make the large number of aluminum or aluminum-alloy products everyone sees and uses—from a bottle-cap or eye-cup to kitchen utensils, automotive engines, doors, railing, an airship, a dredge boom, a railroad coach, or a bridge—to give a range of size. The output of aluminum has increased steadily since the beginning of the century, excepting a setback in 1921 and 1922 and since 1930. The metal is a competitor of copper, monel metal, and steel of standard and special composition.

Source of ore.—Arkansas yields more than nine-tenths of the domestic output of bauxite, the remainder coming from Alabama and Georgia. Ore for reduction to metal averages \$6 a ton at the mines. Bauxite is also used in refractories,



Air View of Garfield Copper Smelter, Utah

chemicals, and abrasives. Some city waterworks use alum, which is produced from bauxite, for settling suspended matter as slime.

The mining of bauxite in 1929 employed 600 wage-earners who received \$512,600 at 11 mines. The value of the output was \$2,239,000, and the principal expenses amounted to \$1,189,000. At 150 manufacturing establishments were 21,210 wage-earners who received \$29,690,000. The cost of materials, fuel, and purchased electric energy was \$94,000,000, and the value of the products was \$153,450,000.

COPPER

"Copper," to quote Report 29 of the United States Tariff Commission, 1932, "is the most important of the non-ferrous base metals, whether considered from the viewpoint of tonnage produced, market value, or economic utility. * * * For many years the United States has been by far the leading producer and consumer of copper, and until recently has produced more than half the total supply. * * * The uses of copper are almost as diverse as are those of steel. * * *"

Between 40 and 50 percent of the copper made is consumed in electrical equipment—generators, motors, transmission and communication lines, and the many manufactures connected therewith. Probably, this proportion of the metal used will continue. Automobiles and wire use around 10 percent each, building and castings 5 to 7½ percent each, and miscellaneous products account for the remainder.

Few persons who handle the copper penny, or copper articles in their homes, or see copper power wires, have any idea of what a copper ore goes through before it becomes metal. Two publications of the American Institute of Mining and Metallurgical Engineers, New York, in 1933, tell the complete story up to the point of manufacture. These volumes are *The Porphyry Coppers*, by A. B. Parsons, and *Copper Metallurgy*, by fifty contributors.

Sources of Copper. There are four principal copper-producing regions in the United States, but single mines outside of these also produce important quantities of ore. These regions are tabulated herewith.

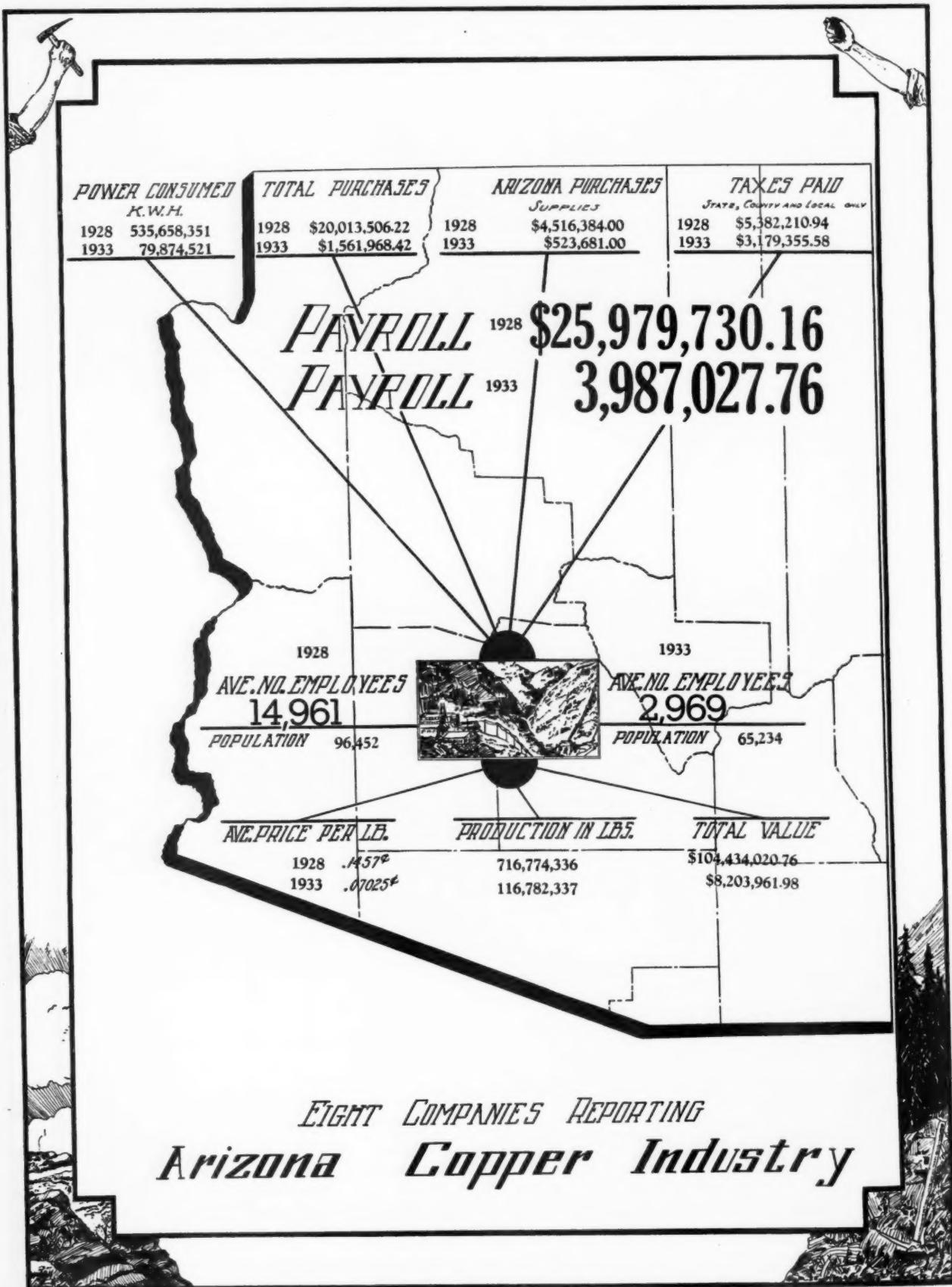
These operations employ a large number of men (65,000 in 1929) throughout the country and many large communities depend solely thereon. As an example, in one state copper operations in a good year (as 1928) meant employment of nearly 15,000 men who received almost \$26,000,000 in wages and salaries; supplies purchased within the state amounted to \$4,516,000, and local, county and state taxes were \$5,382,000. As many as 96,000 persons were dependent on the mining, milling, smelting and transportation of copper-bearing materials.

Mining and metallurgy.—Copper ore is mined or stripped from surface workings at the rate of many millions of

Principal copper producing areas in United States

Geographic Area	Principal Center	Principal Operators	Percent of U. S. Production
Arizona and southwest New Mexico	Ajo, Bisbee, Globe, Inspiration, Jerome, Maghma, Miami, Morenci, Ray, and Chino	Phelps Dodge, Inspiration, United Verde, United Verde Extension, Miami, Nevada Consolidated	46 in 1928, 1929 and 1930
Utah and eastern Nevada	Bingham and Ely	Utah Copper, Nevada Consolidated, Consolidated Coppermines	22 in 1928, 1929 and 1930
Montana	Butte	Anaconda	13 in 1929, 1930 and 1931
Michigan	Houghton and Hancock	Calumet and Hecla, Quincy	10 in 1929, 1930 and 1931

Alaska, Tennessee, and California produced more than 1 percent during 1929, 1930, and 1931, and small amounts came from Colorado, Pennsylvania, North Carolina and Washington.



tons a year by means of electric or steam shovels having capacities of up to eight cubic yards each, as in Arizona, Nevada, New Mexico, and Utah; or mined at shallow depths of 1,000 feet, more or less, as in several states; or mined at depths of 4,000 feet or less as in Montana; and mined at more than 5,000 feet as in Michigan.

Most of the copper ore mined in the United States is concentrated by flotation and the concentrates are smelted. Some copper is recovered by leaching and some by direct smelting. The metal produced is then electrolytically refined, gold, silver, platinum, selenium, tellurium, and other by-products being recovered.

Copper mining and metallurgy during the census year of 1929 show the following results:

Statistics of the copper industry, 1929.

Item	Amount
Enterprises	143
Mines	180
Persons employed (excluding contractors)	48,043
Power equipment, h.p.	701,791

Status of the copper industry.—Copper men prominent in the industry recently gave the following opinions regarding its present status and future:

In 1935, according to W. W. Lynch in *Engineering and Mining Journal* for January, 1935, " * * * the world's copper industry, as a unit, statistically is in better condition than at the beginning of any of the previous three years. * * *."

In *Metals* for the same month, C. F. Kelley states that "Consumption [in 1934] in the domestic market, while still abnormally low, was 4 percent above that of 1933. * * * As the year closed the trend is decidedly upward, and gives ground for a reasonable expectation of better business during the first half of 1935 than was experienced during the last half of the current year. * * * Domestic refined stocks, which were approximately 510,000 tons at the beginning of the year, will have been reduced by more than 180,000 tons during the year [1934]. * * * With minor variations, foreign consumption increased throughout the year to a record peak in November, indicating an increase for the year of approximately 39 percent over 1933. * * * It is difficult to make a prudent forecast for 1935. * * * Measured by any immediate demand there is a large potential over-production. * * * The foreign market is still in a healthy condition so far as existing stocks are concerned. * * *."

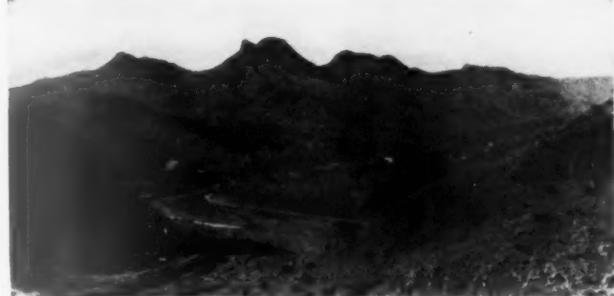
L. S. Cates, in the same journal, showed " * * * that in regard to the amount of copper consumed in 1934, 'boom' conditions existed abroad, whereas the effects of depression were still very evident in the United States. In both domestic and foreign markets, however, the price was far from 'normal.' In both instances this circumstance was due to over-supply. In the United States the



This Plant in Utah Treats 25,000 Tons of Copper Ore Daily



Open-pit at the Ruth Mine, Ely, Nevada



The Ray Copper District, Arizona

unsatisfactory price situation reflects a combination of low consumption, excessive stocks, and of relatively high production of copper from scrap. Abroad, the low price in 1934 reflects the high rate of productivity of foreign mines and their ability to produce copper at a very low cost. A cheering aspect * * * is the fact that in all respects, both in the United States and abroad, there has been a progressive improvement since 1932. The indicated trend is toward further improvement in 1935. * * * It seems probable that cooperation among foreign

producers will before long eliminate present confusion and permit a return to a more stable and remunerative price condition."

C. D. Dallas of Revere Copper and Brass, Inc., in the journal cited, reviews the copper situation and concludes that "It is reasonable to expect that on this basis [an orderly and sustained increase in copper consumption and a sound economic price] any reasonable improvement in world economic conditions will result in a sound and slowly increasing price for copper."

THE ECONOMIC IMPORTANCE OF MINERALS



Surface plant of Inspiration Consolidated, Arizona



Surface view of Copper Mine at Quincy, Mich.

GOLD AND SILVER

National interest in the precious metals.—Excepting unemployment and the many projects proposed and started to lessen it, probably more attention has been recently given to and more written about gold and silver than any other feature of our living. The buying of gold and silver by the Federal Government and its arrival from foreign ports (also decisions of the Supreme Court), constitutes more or less daily news. Certain industries, particularly the jewelry, art, ornament, tableware, and photographic (including films) consume fairly large quantities of the precious metals, but most of them, after being refined, go direct to the vaults of the Government, banks getting as much silver as necessary for circulation.

The American citizen knows of more or less of the foregoing, but only those citizens living in a mining district have any knowledge of the equipment used and the processes involved in extracting gold and silver from their ores and from copper, lead, and zinc ores, in which the precious metals constitute a minor value. Except in rare cases where gold is found in small pockets, the operation of getting gold and/or silver ranges from panning or washing river gravel by hand to extensive mining and treatment of ore in workings and plant costing thousands or millions of dollars—a man in the Sierras, a mine in Virginia employing 50 men, and one in South Dakota employing 2,200 men, for comparison.

Statistics of handling the precious metals.—In the United States, enormous quantities of gold and silver are handled each year and have been since the time statistics were collected, to the end of 1933.

Relation of the precious metals to the base metals.—In the Fifteenth Census of the United States, for 1929, the section *Mines and Quarries* shows some interesting figures on the value relation of gold and silver to copper, lead, and zinc at certain mines.

Operation	Some Handling of Gold and Silver	
	Gold	Silver
Production, fine ounces:		
In 1915	4,887,000	74,961,000
Since 1792	228,882,000	3,245,199,000
Used in manufactures:		
In 1920	\$79,715,000	.....
In 1929 .....	.....	42,359,000
Since 1880	\$1,806,243,000	1,135,231,000 (ounces)
Coinage, fine ounces:		
In 1925	12,109,000	.....
In 1923 .....	.....	86,119,000
Since 1873	181,073,000	976,126,000
Since 1793 (value)	\$4,526,218,000	\$1,427,875,000
Commerce in precious metals:		
Exports in 1928	\$560,759,000	.....
Exports in 1924 .....	.....	\$109,891,000
Exports since 1873	\$6,635,525,000	\$3,438,456,000
Imports in 1931	\$612,119,000	.....
Imports in 1923 .....	.....	\$74,453,000
Imports since 1873	\$8,549,950,000	\$2,150,451,000
Imports since November, 1934	\$403,000,000	.....

(These figures are from the Bureau of the Mint)

Metal	Relation of Precious Metals to Base Metals			
	Percent of total value of five metals	Percent of value from copper mines	Percent of value from lead mines	Percent of value from zinc mines
Gold (184 mines)	7.0	2.4	1.8	0.6
Silver (74 mines)	5.1	2.7	10.6	1.5
Copper (180 mines)	63.2	93.5	2.0	1.0
Lead (171 mines)	13.9	0.5	74.0	17.4
Zinc (204 mines)	10.8	0.9	11.5	79.5



Developmental stage of a small gold mine in California

Minerals Yearbook, 1934, of the United States Bureau of Mines shows the relation by percentage of sources, as follows for 1929:

Percentage of Sources of Gold and Silver		
Ore	Gold	Silver
Copper	22.24	29.49
Lead	1.81	19.23
Zinc	0.6	2.59
Copper-lead and copper-lead-zinc	0.19	4.66
Lead-zinc	3.70	25.71

The remainder, to total 100 percent, is derived from gold and silver ores.

From the foregoing it can be understood that if the market for copper, lead, and zinc are depressed, less of these ores and consequently less gold and silver will be produced. The reverse condition holds if there is good demand for the base metals. In its report 350, of February 6, 1935, the United States Bureau of Mines explains this as follows, in part:

While the practical effect of the Gold Reserve Act of 1934 served to augment the nation's gold and silver reserve, other factors reduced the availability of gold from the complex ores; for example, within the 13 western states and Alaska 62,140,835 tons of copper ore in 1929 yielded 434,986 ounces of gold and 18,020,842 ounces of silver, as compared with 8,363,586 tons yielding 108,727 ounces of gold and 5,854,510 ounces of silver in 1933. * * * The vast copper ore reserves of the United States have associated with them large quantities of gold and silver which can be made available as time justifies the production. Also in 1929, zinc-lead ore amounting to 3,496,400 tons recovered 0.022 ounce of gold and 4.47 ounces of silver per ton, as compared with 1,182,311 tons of 0.036 ounce of gold and 5.21 ounces of silver per ton in 1933.

Use of gold and silver in manufactures and arts.—Large quantities of gold and silver are furnished by the Mint for manufactures and the arts, but there has been a falling off; in fact, as might be expected from the high price for gold, more new gold was returned to the Mint than was used in 1933. As much as

\$80,000,000 of gold has been used in a year, in 1920, and as low as \$17,000,000 in 1933. The total since 1880 is \$1,806,243,000, but doubtless much of this has been returned to the Mint. In silver, as much as 42,359,000 fine ounces has been used in a year, in 1929, and 24,257,000 ounces in 1932. The total since 1880 is 1,135,231,000 ounces.

GOLD

DURING the period 1914-1919 gold was fairly prosperous, but during the next few years it suffered from high prices for labor and supplies and a fixed price for gold; then came a period of lower wages and commodities when mining became more profitable, and more recently with the open market for gold and now with an increase from \$20.67 to \$35 an ounce and selling only to the Federal Government, producers in the United States, and throughout the world, are in a better situation. This stimulus of a high price has, world-wide, revived and saved dormant mining centers, made prospecting very active, encouraged investment, re-developed and re-equipped abandoned and partly active mines and plants, permitted low-grade ores to be

GOLD AND SILVER in addition to contributing to our monetary base, enter into such important industries as the jewelry trade, the arts, the motion picture industry, photography, tableware, and ornamental industry.

The Arts industries since 1880 have used gold valued at \$1,806,243,000. In the same period they utilized some 1,135,231,000 ounces of silver.

handled, paid many and large dividends, employed thousands of men upon whom depend many communities, and consid-

United States Gold Production in 1934

State or Territory	Ounces
Alaska	541,283
Alabama	2,951
Arizona	145,234
California	709,963
Colorado	321,740
Georgia	900
Idaho	88,729
Michigan	49
Montana	95,577
Nevada	142,494
New Mexico	26,720
North Carolina	666
Oregon	32,580
Pennsylvania	557
Philippines	332,974
Puerto Rico	57
South Carolina	223
South Dakota	481,749
Tennessee	531
Texas	303
Utah	137,943
Virginia	529
Washington	6,714
Wyoming	4,726
Total	3,075,192
Total in 1933	2,556,246
Total in 1915, year of largest output	4,887,604

erably augmented the gold output and supply.

In the United States, gold production during 1934 was 500,000 ounces more than in 1933, but the value was doubled —\$55,000,000 extra money can do and did much for the industry and for the country. Preliminary production figures for certain states show an 18 percent increase in Alaska, 96 percent in Arizona; 14 percent in California, 31 percent in Colorado, 34 percent in Idaho, 60 percent in Montana, 49 percent in Nevada, 59 percent in Oregon, 23 percent in Utah, 51 percent in Washington, 123 percent in Wyoming, a total average of 19 percent. The Appalachian States averaged a 253 percent gain, with Virginia more than 1,000 percent. The Philippines, whose gold mining is now firmly rooted, gained 19 percent.

Source of gold.—The Bureau of the Mint and the Bureau of Mines have issued the foregoing figures of gold production.

The total value in 1934, based on \$35 an ounce, was \$107,631,700. In 1933 and 1915, at \$20.67 an ounce, the totals were \$52,842,300 and \$101,035,700. Of course, the fine ounce is the only true measure for comparing the progress or production of gold mining. The price is not permanent.

Total production of gold from certain states is as follows, according to the United States Bureau of Mines:

Name	Period	Value
Alaska	1880-1934	\$ 438,000,000
Arizona	1848-1934	168,000,000
California	1848-1934	1,904,000,000
Colorado (Cripple Creek half of total)	1858-1934	743,000,000
Idaho	1863-1934	144,000,000
Montana	1862-1934	315,000,000
Nevada	1859-1934	470,000,000
New Mexico	1848-1934	39,500,000
Oregon	1852-1934	104,600,000
Philippines	1907-1934	59,000,000
South Dakota	1876-1934	338,000,000
Southern Appalachian States	1799-1934	52,000,000
Utah	1865-1934	149,000,000
Washington	1860-1934	31,000,000



THE ECONOMIC IMPORTANCE OF MINERALS



Along the Mother Lode, California

With regard to the recovery of gold from its place of occurrence, a fifth to a quarter each is taken from placer deposits and by cyanidation of ores, a fifth to a third is saved by amalgamation with mercury, and the balance of a third is extracted from ores and concentrates by smelting. The quantity recovered by the last mentioned is increasing through the change in metallurgy whereby concentration by flotation is gaining popularity, and instead of local treatment of the sulphides they are trucked to smelters.

SILVER

IN THE past, the market for silver has been more or less widely fluctuating.

In finance, silver and gold are generally considered together, but we see only silver in circulation and mainly so in manufactured articles. Great quantities of silver are moved around the world, particularly to and from India and China, which have long controlled sales and prices. In Shanghai last year was a stock of 450,000,000 ounces, now half. The firm of Handy & Harman, New York, refiners of precious metals, issue a report on the course of events in silver in the United States, including world trade, and in London, Samuel Montagu & Company, bankers and bullion merchants, do likewise, covering the world especially. Silver is an important metal and by an act of Congress in 1934 the United States policy now is that the proportion of silver to gold in our monetary stocks shall be increased and maintained at one-fourth the latter. Silver is to be purchased at home and abroad as required. By this legislation, the price of silver is practically fixed for this country, but the future here depends upon the volume and rate of purchases by the Treasury Department.

Source of silver.—The Bureau of the Mint and the Bureau of Mines have issued figures for 1934 as shown herewith.

At an average price of 64.6 cents an ounce, the total value for 1934 is \$20,274,205. In 1933, at 34.73 cents, it was \$8,050,920, and in 1915, at 49.68 cents it was \$37,397,000.

Total production of silver from certain states is as follows, according to United States Bureau of Mines figures:

Silver Production of Certain States		
Name	Period	Quantity, fine ounces
Arizona	1860-1934	204,000,000
California	1848-1934	87,000,000
Colorado	1858-1934	667,000,000
Idaho	1863-1934	354,000,000
Montana	1862-1934	639,000,000
Nevada	1859-1934	547,000,000
New Mexico	1848-1934	56,000,000
Texas	1885-1934	24,000,000
Utah	1865-1934	604,000,000

Silver Production of United States in 1934

State or Territory	Ounces
Alaska	160,033
Alabama	364
Arizona	4,067,305
California	799,644
Colorado	3,309,062
Georgia	46
Idaho	7,536,867
Michigan	529
Missouri	5,000
Montana	3,354,021
Nevada	2,699,480
New Mexico	1,120,624
North Carolina	9,837
Oklahoma	52
Oregon	57,833
Pennsylvania	4,004
Philippines	226,524
Puerto Rico	11
South Carolina	68
South Dakota	106,022
Tennessee	61,450
Texas	737,908
Utah	7,091,440
Virginia	78
Washington	35,181
Wyoming	835
Total in 1934	31,384,218
Total in 1933	23,002,629
Total in 1915, year of largest output	74,961,075

The bulk of the silver listed is from base metals. There are a few individual silver mines in California, Colorado, Idaho, and Texas; but no longer have we any silver centers that yield a fraction of Mogollon, New Mexico; Randsburg, California; Rochester, Tonopah, and Virginia City, Nevada. Once, they were great producers—silver by the ton; now, they are at low ebb, naturally, but with some revival.

If we exclude mention of the silver recovered from base metals, the princi-



A California Gold Dredge

pal references will be to the by-product of gold ores in California, mainly from the Grass Valley-Nevada City district; a dozen counties in Colorado, with Eagle accounting for more than half of it, produced most of Colorado's silver; in Idaho, the largest silver mine and in the United States is the Sunshine, which now has a 500-ton plant at work; a fifth of the Montana metal came from straight silver ores; in Nevada, the Tybo was the largest producer and other centers were revived; the Mogollon district of New Mexico has been equipped for new production; at Shafter, Texas, the famous Presidio silver mine was reopened; and in Utah, nearly all the silver came from other ores.

With regard to the recovery of silver from its place of occurrence, a few years ago as much as a sixth was extracted by cyanidation and the balance by smelting. Now, the bulk is recovered by smelting. The cause of this is the small tonnage of straight silver ores now being mined and amenable to cyanidation, also expansion of the flotation process.

IRON ORE AND STEEL

SOME conception of the iron and steel industry may be gained from the following figures for 1929: Ore mined, 73,000,000 tons; pig iron made, 42,600,000 tons; steel ingots and castings made, 56,400,000 tons. The difference of 14,000,000 tons between pig iron and steel production is accounted for by works and outside scrap iron and steel. *The Annual Statistical Report* of the American Iron and Steel Institute covers 119 pages of really interesting information.

IRON ORE AND STEEL

If many motor vehicles are being sold, if the demand for canned food is good, if shipbuilding and boiler-making is active, if castings are in demand, if wire is required for bridges or mining or on farms, if bridge-building and house and building construction are steady, if agricultural machinery is moving to the farms, if more gas, oil, and water pipes are being laid, and if the railroads require more rails, the mining of iron ore and the operation of iron furnaces and steel mills is at a satisfactory percentage of total capacity. Naturally, some of the foregoing demands for products are seasonal. But the industry does not stop at this point: it gives impetus to the mining of coal and making of coke; the mining and preparation of chromite, fluorspar, limestone, magnesite, manganese, molybdenum, silica, tungsten, vanadium, and zirconium, and increased use of oil and gas. The fluorspar and limestone act as fluxes in smelting; the chromite, magnesite, and silica are used in refractory brick; and the chromite, manganese, molybdenum, tungsten, and vanadium make the ferro-alloys which in turn, singly or two or more together, make the steel hard or tough and also produce the well-known stainless metal. The influence of iron and steel is widespread. Even slag, the residue from smelting iron ore, is used in making cement and finds a place as railroad ballast and concrete on our highways.



IRON ORE

During 1929, to quote the Fifteenth Census of the United States, the mining of iron ore employed 30,707 persons by 180 enterprises at 208 mines and preparatory works in 18 states. Other figures follow:

<i>Some Details of Mining Iron Ore</i>	
Iron ore:	
Quantity mined, tons.....	73,900,000
Value at mine	\$196,000,000
Wages and salaries paid	\$ 46,000,000
Cost of supplies, fuel, and power....	\$ 28,000,000
Prime movers and electric motors driven by purchased energy, horse- power	499,000
Electric energy used, kilowatt-hours	475,000,000
Coal and coke burned, tons	950,000
Fuel oil burned, gallons.....	2,300,000
Gasoline and kerosene used, gallons..	507,000

Minnesota is the principal iron-ore producer, contributing 63 percent of all. With Michigan it produces 83 percent, and with Wisconsin 87 percent. The three districts have yielded a total of 1,600,000,000 tons. This ore is mostly moved by boat down the Great Lakes and then to Gary, Columbus, Pittsburgh, Youngstown, and other centers by rail. Large stocks of ore are maintained at the mines, lower Lake ports, and at the furnace plants, as much as 20,000,000 tons. Alabama, around Birmingham, is the next important source of iron ore, its output in 1929 approaching 9 percent of the total. This ore is generally self-fluxing, but contains only 37 percent



The William G. Mather, Flagship of the Present Fleet

THE ECONOMIC IMPORTANCE OF MINERALS

Lake Superior Iron Ore District, producing 87% of annual iron ore tonnage, in 1929-1930-1931, paid in local and state taxes some \$24,698,000; supported 74 villages and towns with a total population of 189,000; \$300,000,000 is invested in these mines alone. Eight railroads serving the industry, maintaining 1,500 miles of track, have an investment of \$45,000,000. Twenty loading docks at Lake ports cost \$70,000,000. These railroads and docks employ 2,400 men who, in seven months, earn \$1,800,000.

Ore is moved by 300 vessels employing in all operations, 11,000 persons, who in 1929, received \$9,600,000 in wages. At lower Lake points unloading docks worth \$30,000,000 employ 1,200 men who are paid normally, \$1,100,000 annually.

iron, whereas that from the Lake Superior region averages 52 percent. The balance of the iron ore comes from Pennsylvania, New York, New Jersey, and other eastern states, and from New Mexico, Utah, and other western states.

The Lake Superior Iron Ore Association states that during 1929, 1930, and 1931 the local and state taxes paid in that region totaled \$24,608,000. Seventy-four villages and towns with a population of 189,000 persons were wholly or partly depending on the ore industry.

As to the reserves of iron ore, we have fair supplies in Alabama and in several central and western states; and including the lower grades in the Lake Superior region, as much can be mined there as has been taken out. Opinions differ regarding the future, but on the whole there is an enormous quantity awaiting extraction and preparation for the blast furnaces.

Mining practice.—Although probably there is more iron ore mined on the surface than underground, the former practice is not followed everywhere. The preponderance of stripping operations and tonnage in Minnesota, which accounts for two-thirds of that state, gives this result. Electric and steam shovels of

large capacity do the stripping and loading. Stripping is done also in Utah. Most of the ore in Michigan and Alabama is mined by underground methods. It costs \$5.53 per ton to do this in Michigan and the ore sells for 79 cents less; taxes accounted for 89 cents of the total. The range from all mining methods for individual mines is a few thousand to one, two, or three million tons or more a year.

In several states, particularly Minnesota, some of the ore is washed to free it of silica. In New Jersey it is treated magnetically. Between 15 and 20 percent of the iron ore of the United States has been prepared by some process before being sent to the furnaces.

Ore transportation.—At Columbus, Ohio, in 1934, R. C. Allen, president of the Lake Superior Iron Ore Association, told a group of A. I. M. E. engineers that \$300,000,000 was directly invested in the mines. The ore is hauled over eight railroads that maintain 1,500 miles of track representing an investment of \$45,000,000. The 20 loading docks at Duluth and other upper Lake ports cost \$70,000,000. These rail and dock operations employed 2,400 men, who received \$1,800,000 in the season of seven months.

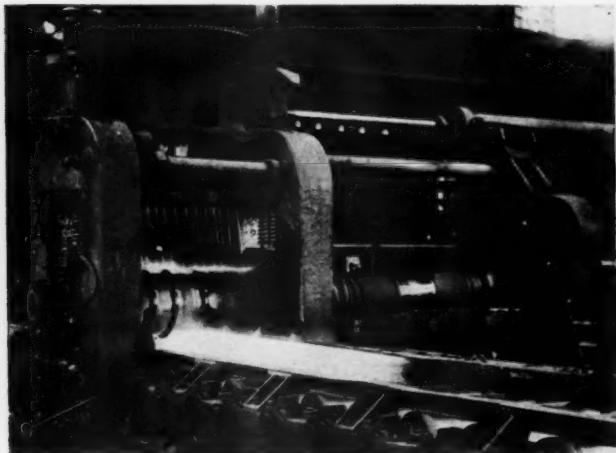
To the lower Lake ports of Gary, Detroit, Cleveland, Ashtabula, and Conneaut, the ore is moved in more than 300 vessels which can carry 2,754,000 tons a trip. Eleven thousand persons are engaged in this work and received \$9,600,000 in 1929. These vessels are valued at \$207,000,000. Fifty-three tugs worth \$3,000,000 and employing 425 are an appendix to the fleet. At the lower Lake ports are 16 unloading docks worth \$30,000,000 and employing 1,200 men who were paid \$1,100,000.

The rapidity of the loading and unloading of these ore-boats is remarkable, records of about an hour for the former operation and four hours for the latter are known. The ore unloaded is either dumped onto stock piles or loaded direct into railroad cars.

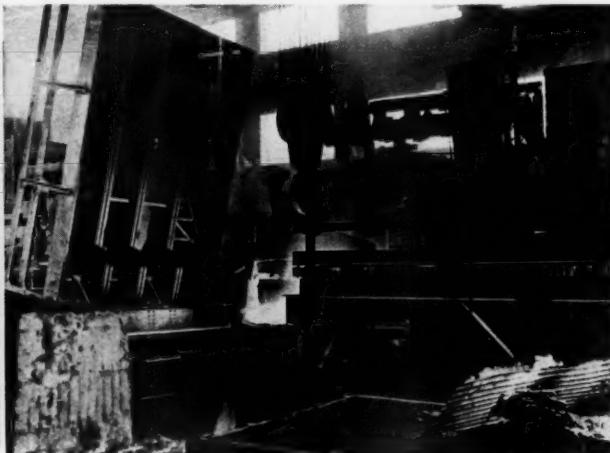
Reduction of ore to iron.—The States that produce the most ore do not produce much iron, excepting Alabama, and several States that do not have any ore deposits, excepting Pennsylvania, produce most of the iron. Formerly, it was the practice to take the ore to or near the coal deposits and where coke was made; now, the trend is or has been to reduce the ore near centers of population and consumption of iron and steel.

There are 250 blast furnaces in the country, mostly around Pittsburgh, Chicago, Youngstown, Birmingham, and along the Ohio River; also at Columbus, St. Louis, Pueblo, and Ironton. But all of these are not required, so in a year of big production, as 1929, only 165 furnaces were in blast. Individual furnace capacity may run from 300 to 1,100 tons, the average is around 540 tons a day. Each ton of ore may need a half ton of coke, a fifth ton of limestone, and a large volume of air (oxygen) in the smelting process. As a rule, in addition to the iron ore, blast furnaces are charged or fed with scrap material as scale from the mills, spillage, and other iron-bearing material.

Ferro-alloys were mentioned: A ferro-alloy is a solid solution or mixture of iron and some element which, when added to steel, imparts some desirable quality



Pouring Steel from a Large Electric Furnace



A 38-inch Blooming Steel Mill

as hardness or toughness thereto. The ferro-alloys are made in special blast-furnaces and in electric furnaces. They are, ferro-chromium, ferro-manganese, ferro-molybdenum, ferro-phosphorus, ferro-silicom, ferro-titanium, ferro-tungsten, ferro-vanadium, ferro-zirconium, silico-manganese, silico-spiegel-eisen, spiegeleisen and zirconium-spiegel-eisen. These furnace products are of immense importance and a big year's output exceeds 800,000 long tons and \$75,000,000. This gives an average value of 24 cents per pound, compared with say 0.9 cent for iron and 1.8 cents for average steel.

STEEL

UNLESS used as iron, all iron made in blast-furnaces is converted into steel and into ferro-alloys. Steel-making is done in Bessemer converters, electric furnaces, and in open-hearth furnaces. Molten iron and scrap is poured and fed into the furnaces which are heated by gas, tar, or oil. After about 12 hours the metal is run into ladles holding 100 tons or more each and from them into iron molds of 2 to 10 tons or more capacity each. Later, the molds are stripped from the ingots which are reheated and then rolled into rails, plate, sheet, rods, bars, structural shapes, wire, and other products for further manufacture.

Normally, there is fair regularity in the proportion of steel used for certain purposes, as follows: 16 to 28 percent in rails, 16 to 22 percent in buildings, 10 to 18 percent in motor vehicles, 8 to 11 percent in mineral mining, 3 to 6 percent each in agriculture and cans, 3 to 4 percent in machinery, 16 to 20 percent in miscellaneous bolts, nuts, wire, nails, zinc-coated sheet, and the remainder in exports.

The Bureau of the Census reported in 1929 that there were 105 blast-furnace and 486 steel-mill establishments employing 419,000 wage-earners who were paid



Stripping Molds from Steel Ingots

\$731,000,000. The cost of materials, fuel, and purchased electric energy was \$2,514,000,000 and the value of the products \$4,137,000,000.

Steel and food.—As an increase in demand for motor vehicles affects the steel industry, so does the making of tin plate for food containers or cans. In general, tin-plate mills are more steadily employed than many others—rolling steel sheet and coating it with tin. The amount of food eaten from cans is enormous, especially during winter. More than 150 kinds of fish, fruit, meats, soups, vegetables, and other foodstuffs are put into cans and thus constitute a great reserve of good food. Eight percent of the steel made is consumed in making tin

plate. Most of the scrap resulting from cutting and punching tin plate becomes tin salts and secondary metals, but much from the emptied cans is never recovered, because they are generally discarded as garbage. It may be added that good tin plate is coated with 2½ percent of tin and half of the tin imported is consumed in coating steel plate. There are more than 550 tin-plate mills in the United States, a few being able to make up to 4,000,000 boxes of plate in a year.

■ ■ ■

In more than 250 communities, scattered from Maine to California and from Minnesota to Texas, some phase of the steel industry is an important economic factor. According to a statement by the American Iron and Steel Institute, steel products covered by the steel code are manufactured in 433 different plants strategically located with respect to raw materials or markets.

The aggregate population of these cities and towns which have some part of the steel industry totaled 22,000,000 at the 1930 census. Employes of the steel industry and their families, therefore, constitute approximately 10 percent of the total population of the steel-making districts, according to the Institute.

With an aggregate investment of nearly \$5,000,000,000 and with more than 400,000 employes, steel ranks in many of those communities as the principal industry. Payrolls amounting to more than \$455,000,-



Stripping Iron Ore in Minnesota

THE ECONOMIC IMPORTANCE OF MINERALS



Iron-Ore Mining in New Mexico

000 were distributed in steel towns during 1934, while the industry annually pays an estimated \$80,000,000 in taxes to federal, state and local governments.

The greatest concentration of the industry, as might be expected, is in the leading industrial states. Pennsylvania leads with 130 plants making code steel products, while Ohio, with 87 plants, ranks second place. Illinois, New York and Indiana follow in succession. Alabama, Michigan, New Jersey and West Virginia each have 15 plants making steel products.

The industry is represented in the South by 45 plants located in Alabama, Kentucky, Maryland, Missouri, Virginia, Tennessee, Texas, Georgia and Oklahoma.

In all, 29 states have one or more plants for the production of products listed under the steel code.

LEAD

LEAD occurs as galena in ores alone, as in southeast Missouri, or with zinc, as in Oklahoma and Idaho. In most of the Rocky Mountain States a certain amount of silver and gold is recovered with the lead.

Lead is a most useful metal, providing, for example, the starting batteries in 25,000,000 motor vehicles and many electric locomotives, the conduit for electric power and telephone cables, the base of paints, alloys, roofing material, solder, and type metal for printing.

The Lead Industries Association assists the industry in many directions. It is an organization of lead mining, smelting, refining, and manufacturing companies whose purpose is to disseminate accurate information regarding lead products and how they best may be used. A 104-page booklet, *Lead*, tells all about the metal—a short chapter on the mining, milling, and refining, and much useful information on every feature of lead.

The Lead Industry.—The position of lead is not so strained as some other metals, and is improving, yet stocks are fairly heavy, largely due to secondary metal entering the market. This is mainly from refined battery scrap. Present mine operations are on a re-

duced basis, notwithstanding the improved prices of gold and silver. With regard to this last item, F. E. Wormser, of the Lead Industries Association, recently stated that only a small amount of lead was produced as a result of the incentive furnished by a higher silver

market. Lead producers know that if they increase production merely to obtain more silver, the resultant decline might more than balance any increased compensation from the sale of by-product silver. In Idaho, silver is a by-product of lead, whereas in Utah, lead is more or less a by-product of silver, at current prices. For respective examples, the Bunker Hill & Sullivan and Silver King Coalition may be cited. The foregoing conclusion has also been reached by A. G. Mackenzie, of the Utah Chapter of the American Mining Congress, that silver production in the United States responds to production of the associated base metals rather than to the silver price.

concentrates are smelted. The *Yearbook* of the American Bureau of Metal Statistics, 1933, lists 11 smelting works in eight states capable of reducing 3,353,100 tons of ore and products a year; five works in three states for Missouri ores, able to smelt 626,500 tons of concentrates and make 416,500 tons of lead; and 10 refineries in eight states able to make 895,000 tons of refined lead.

Uses.—Lead is employed in large quantities in storage batteries, in cable coverings, and as containers in making or using corrosive chemicals, particularly sulphuric acid. A large number of lead compounds are made and used in various industries. Lead has been used in paint during a period of more than 4,000 years. Building and house plumbing consume much lead. Lead is practically indestructible, and much of it returns to commerce as scrap.

In the manufacturing of lead products in 1929 the cost of materials, fuel, and purchased electric energy was \$203,900,990, and wages paid to 4,819 men in 19 establishments were \$7,577,000. The value added by manufacture was \$28,200,000.

Extent of Industry.—For 1929 the Bureau of the Census reported that 155 enterprises operated 171 mines and employed 14,000 men, plus 1,000 others. The lead was valued at \$48,500,000, and of

LEAD enters into such important industries and furnishes the raw material for batteries for motor vehicles and electric locomotives, conduits for electric power and telephone cable, paints, alloys, roofing material, solder, type metal for printing, corrosives, chemicals, plumbing...

In 1929, 155 enterprises operated 171 mines and employed 14,000 men who received approximately \$24,000,000 in wages.

According to E. A. Behr in *Metals* for January, 1935 " * * the prospects are for declining stocks. Furthermore, everything points to a continuing increase in consumption which has been the condition over the last two years, and therefore, the outlook is definitely encouraging * * *

Sources of Lead Ore.—Lead mining, all underground work, is principally done by a dozen large companies in a score of states. For years Missouri has led all others, mainly from the southeastern part of the state, followed by Utah, Idaho, Oklahoma, Kansas, Montana, Colorado, and others. Recent conditions have changed the general order, and Idaho now leads Utah. In the tri-state district of southwestern Missouri, Kansas, and Oklahoma, lead is a by-product of zinc mining, but constitutes a tenth or more of the total lead of the United States. Some lead ore is smelted direct, but the bulk is crushed and concentrated by jigs, tables, and flotation, and the



Loading Equipment of Tailings Retreatment Operation

this the wage-earners received nearly one-half. Other metals recovered were \$7,560,000 of zinc, \$6,949,000 of silver, \$1,336,000 of copper, and \$1,171,000 of gold. Custom milling brought in \$1,189,000 and other operations \$841,000 making \$67,560,000 in all.

ZINC

ZINC occurs in ores free from lead, as in New Jersey and Tennessee, or more generally associated with lead, as in Oklahoma and Utah. More than 40 percent of the metal is used in coating steel sheets, pipe, various shapes, and wire. The making of brass consumes a large tonnage; so do pigments, rolled zinc, and die-castings. The American Zinc Institute assists the industry generally and the Tri-State Zinc and Lead Ore Producers Association in the central states.

Status of Industry.—Zinc mining has been less burdened with heavy stocks than have several other metals, and is improving. Some forms of zinc disappear entirely, and scrap and secondary metal are relatively unimportant factors in the market. According to Norman Hickman in *Engineering and Mining Journal* for January, 1935, the outlook for zinc in the pigment field is promising, and in the brass industry and in motor vehicles there has been a substantial pick-up.

A study of zinc prices during about 25 years, excepting the war period, shows a rather irregular line, mostly between 4 and 7½ cents a pound, with recent years from 6 to as low as 2.30 cents, and an average in 1934 of 4.16 cents.

Source of Zinc.—The Oklahoma-Kansas-Missouri district is by far the greatest producer (up to 60 percent) of zinc ore in the United States. New Jersey, Montana, Utah, New Mexico, New York, Idaho, and Nevada normally produce a large tonnage.

At the annual meeting of the American Zinc Institute, at St. Louis in the spring of 1934, was held a symposium on the zinc situation in the producing States. Idaho production is less than half its maximum, mostly by-product of lead . . . Montana has mines in the Butte district, at Philipsburg and Basin, a zinc concentrator at Anaconda, and electrolytic plants there and at Great Falls . . . Nevada's future is being improved by better roads, electric supply, and the higher prices for gold and silver. . . . New Mexico is handicapped by relatively high costs of mining, milling, and transportation, but these are somewhat offset by the higher zinc content of the straight zinc ores and the greater metal content of the complex sulphide ores. . . . New Jersey is producing a fifth of the zinc of the United States—all from two mines of one company operating under ideal conditions. A community of 5,000 is dependent thereon and will be so for many years. Local taxation has caused concern. . . . New York has the Balmat and Edwards mines, both with concentrating plants working five days a week. The state's zinc output exceeds 20,000 tons a year. . . . Tennessee has four districts producing, monthly, 600 to 700 tons of oxide ore and 3,500 tons of sulphide concentrates. . . . Virginia has one zinc mine, originally a lead producer only. Separation of the blende and galena was difficult, but has been overcome by flotation. . . . Utah ores in 1932 averaged 11.35 percent lead, 0.26 percent copper, 8.0 percent zinc, 0.098 ounce gold, and 10.17 ounces of silver. The gross value of this zinc was equiva-

lent to 28.15 percent of the total value, though only 81 percent of the zinc is actually recovered. . . . The Tri-State District has gone through a trying period, but the upturn is well marked and the outlook is decidedly encouraging. . . . Wisconsin mining is at low capacity. The average life of the mines is four years, therefore continuous prospecting is necessary. Many low-grade unmined ore bodies can not be profitably worked under present conditions.

With reference to the Tri-State district, in 85 years it has shipped nearly 19,000,000 tons of concentrates worth \$827,000,000. As many as 10,200 men have been employed, and at present 4,300. Mining is done at relatively shallow depths. About 80 mines are now delivering ore to 46 plants in which it is crushed, jigged, tabled, and floated. A score of retreatment plants are at work. The mill products contain 60 percent zinc and nearly 80 percent lead, respectively.

The district embraces numerous towns and a large rural population. Of some 65,000 people in this area, at least half are very directly dependent upon the mining industry. As many others probably are partly or indirectly dependent thereon. Smelting operations in Oklahoma, Kansas, Arkansas, Illinois, Pennsylvania, and West Virginia also support considerable population in handling concentrates from this field, and the total number affected by manufacturing and selling the finished products is large. The local industries directly dependent on this mining and milling are foundries, machinery makers, powder manufacturers, power-plants, and transportation.



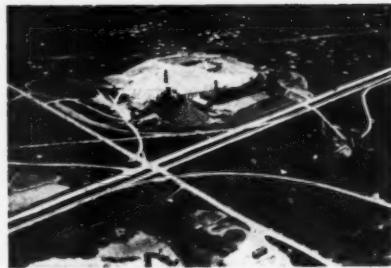
Bird Dog Central Mill of Commerce Mining and Royalty Co.

THE ECONOMIC IMPORTANCE OF MINERALS

Some figures from the Bureau of the Census and Statistical Abstract for 1929 are as follows:

Zinc Mining and Manufacturing

Item At mine:	Amount
Enterprises	148
Mines	204
Persons engaged	12,799
Salaries and wages paid..	\$18,782,000
Metals produced:	
Zinc	34,844,000
Lead	7,638,000
Silver	670,000
Copper	437,000
Gold	261,000



Typical Mining Property Near
Picher, Oklahoma

the various products of which it is an essential constituent. (These are zinc-coated materials, zinc dust, brass, and other alloys, paints, chemicals and salts.)

ZINC enters largely into "coating" for steel sheets, pipe and wire; the paint industry and the making of brass. In 1929 this industry, at mines and in factories employed 24,417 persons, at a wage of \$36,492,000.

In *The Development of American Industries* (Prentice-Hall, Inc., New York, 1932), a chapter on "The Zinc Industry" contains the following items in part:

Due to the high grade of many zinc deposits in foreign countries and the low cost of production under modern metallurgical treatment, these foreign countries are now supplying the world market with an over-abundance of low-priced zinc. In the face of this competition, the American industry has been compelled to devote itself mainly to the domestic market. There are large reserves of zinc ore in the United States which are capable of meeting all probable domestic demands for many years to come.

Not all of the zinc ore mined in the United States is used in the production of slab zinc, for about one-sixth of it goes directly into certain zinc compounds—chiefly zinc oxide, lithopone, and various zinc salts.

The principal by-product of zinc smelting and oxide manufacture is sulphuric acid, obtained from the sulphur gases produced in roasting the zinc concentrates.

In the electrolytic plants a part of this acid is used in leaching the roasted ore, to get the zinc content into solution; and in recent years large quantities of acid have been used in converting natural phosphate rock, from western deposits, into the soluble superphosphate which is so valuable as an agricultural fertilizer. The acid produced by the retort smelters and zinc-oxide plants is sold mainly to the chemical and oil-refining industries.

Additional by-products of zinc smelting are certain of the metals associated with zinc in its ores, which are not entirely separated in the process of concentrating, including lead, silver, gold, copper, and particularly cadmium, the use of which has been greatly expanded of late years.

The widespread use of zinc in modern life is not generally appreciated, because as a rule zinc loses its identity in

scouring the world for scrap. Here, the Bureau of Mines does this. We have had as much as \$300,000,000 of secondary metal recorded in one year. A secondary metal is a refined metal recovered from scrap and is equal in quality to primary metal. Foundries and other metal consumers need have no fear in using it, provided that they know its source. In 1933 our scrap and secondary business amounted to 722,000 tons valued at \$101,269,000.

J. W. Furness, of the United States Bureau of Mines, recently reviewed the future of secondary metals. He cited the statement of the National Association of Waste Material Dealers that more than a quarter million persons are engaged in salvaging waste in this country, not all on metals, of course, but the secondary metal business is of importance in our industrial life. In time of depression, secondary metals, due to price, evidently constitute in many applications the larger part of the consumption. They have already been reduced from their ore and their reclamation is far less expensive, unit for unit, than the actual mining of a tonnage of ore enough to produce the equivalent in metal. In many, perhaps most, cases there is no chemical difference between secondary and primary material. The disadvantage in the cost of production is one that the primary producer cannot overcome by quality claims. He may actually be forced to enter the secondary industry, and has, as is well known during the past two years. The secondary reservoir that has been exhausted during a depression will have to be re-supplied by virgin metal; but when this supply has reached a certain point, once again the demand for new metal will taper off and secondary metal play its normal part. Mr. Furness concludes by stating that the secondary metal industry is but in the dawn of its development, despite its history. Secondary mineral operations do not depend on shortage of virgin supply.

An interesting feature or trend in the scrap and secondary metal business is the acquiring of large plants by producers of primary metal—the American Smelting & Refining Company and the National Lead Company, as examples. In operating both primary and secondary smelters they are able to use as much scrap as is desirable and also judge better the condition of the scrap market.



Scrap [redacted] at Perth Amboy Plant of the American Smelting and Refining Co., New Jersey

MINOR METALLIC MINERALS

ALTHOUGH of importance, antimony, cadmium, chromite, manganese ore, mercury, molybdenum, titanium tungsten, uranium, and vanadium may be considered as a minor group whose output is given in the general table of mineral products. A few details follow:

Antimony.—In a busy year, as 1929, the United States produces from ores less than 3 percent of the antimony content of imported materials. At present the ores come from Idaho and Texas.

Cadmium.—This metal is a by-product of zinc and is used in alloys and plating. We have an ample supply, but dependent on activity in zinc.

Chromite.—In the best of times we produce a fraction of the chromite that is imported, and this country is a large consumer.

Manganese ore.—Imported ores range from 46 to 55 percent manganese, whereas the metallurgical ore mined locally contains 5 to 10, 10 to 35, and 35 percent or more; chemical ore is of higher grade. Minnesota yields the bulk of the low-grade ore and Montana the chemical ore.

larily California, has produced large quantities of mercury. Mercury is elusive material and it cannot be said that there is much secondary metal reclaimed; that is to say, it is used repeatedly, with perhaps re-distillation, and every time there is a loss.

Source of mercury.—California has always been the largest producer. Nevada was second, but it has been overtaken by Oregon. Texas, Arkansas, Arizona, Alaska, and Washington contribute several thousand flasks a year. Recent production has been irregular; so has the price, which averaged 97

cents per pound during 1934. At this there is little profit.

The United States Bureau of Mines has published the figures shown herewith.

The census for 1929 reported that the wage-earners were paid \$1,384,000. The principal expenses of operation and development totaled \$2,381,000.

Molybdenum.—In Colorado and New Mexico are large deposits of molybdenite, and the United States is self-sufficient in this respect. The ore is low grade, yet is profitable to mine and mill.

The mining and treatment of molybdenum, titanium, tungsten, and vanadium ores gives employment to more than 600 men and yields in a year products valued at \$4,500,000.

Some Details of Mercury Mining

Item	California		Other States	
	1929	1932	1929	1932
Men employed at mines.....	419	144	329	187
Men employed at plants	134	73	88	64
Mercury produced, flasks*.....	10,139	5,172	13,543	7,450
Mercury per man at mines and plants included in study of 91 and 82 and 80 and 85 percent of total output, pounds/shift.....	4.81	9.60	6.34	6.98

*A flask contains 76 pounds of mercury.



Monel Metal Condenser at a California Mercury Mine

MERCURY, more popularly known as quicksilver, is found in thermometers, automatic switches, and vapor lamps, and in blasting detonators or in electric arc rectifiers in power-plants, and in a number of other important commodities as medicine, and for saving gold from ores. The United States, particu-



A Manganese Mine

MAJOR NON-METALLIC MINERALS

CLAY, coal, lime, natural gas, petroleum, phosphate rock, potash, stone, and sulphur constitute the major non-metallic minerals, and some details thereof are given in what follows:

CLAY

FIRECLAY, for firebrick and special shapes for furnaces, constitutes three-fourths of the clay mined in the United States in a year. Pennsylvania, Ohio, Missouri, and California supply more than half of this type of clay. Georgia and South Carolina yield most of the kaolin or china clay (we import almost as much), and miscellaneous clays come from several states. About \$15,000,000 is the mine or quarry value of all clays in a good year. In 1929, employment was given to between 4,000 and 5,000 men at 236 operations. In addition to refractories, clay is used in pottery, paper, rubber, paint, and common brick. Ten times as many establishments do this manufacturing, employing up to 133,000 persons and paying \$143,000,000 in wages.

A considerable quantity of clay is consumed in making cement, which consists of 1 part of clay to 4 parts of limestone. These are ground together wet or dry, calcined at high temperature, and the resultant clinker ground to required fineness.

COAL

THE mining and preparation of coal for the market is a huge industry. The United States has, in a year, produced 90,000,000 tons of anthracite, 570,000,000 tons of bituminous coal, and 2,000,000 tons of lignite. This fuel came from surface workings yielding a few tons to several thousand tons a day to deep mines producing up to 8,000 tons a day. At the mines the coal had a total value of \$1,500,000,000. At one time there were more than 9,000 bituminous mines; now there are about half that number being worked and production has dwindled to about 55 percent of the output and 40 percent of the value given, not solely because of the recession in industry. There are now 550,000 men employed. The rail, water, and motor-truck business that coal makes may be realized from such tonnages. In a good year, as in 1929, 35 percent of the rail traffic was from coal mines, and the railroads burned a quarter of all the coal mined. Almost as much as used by householders.

The coal industry is served in many directions—engineering and marketing—by a number of organizations too numer-



Mining Kaolin or Clay in Georgia

ous to list here, but we may mention the Alabama Mining Institute, Anthracite Institute, Appalachian Coals, Inc., Central Pennsylvania Coal Association, Coal Mining Institute of America, Illinois Coal Operators' Association, National Coal Association, and Rocky Mountain Coal Mining Institute. Also there are a number of institutions capable of doing careful research in coal, as Battelle Memorial Institute, Bureau of Mines, Carnegie Institute of Technology, Mellon Institute, The Pennsylvania State College, and University of Illinois.

Taxes paid.—Income tax paid the Federal Government by coal mines during 1929 and 1932 was given in the introductory section of this review of the mineral industry, and some figures compiled by the National Coal Association and rearranged are given for the period 1928-1931:

As regards anthracite, local and state taxes were 9.3 cents per ton in 1916 and

Mining.—The average coal consumer regards coal as coal, a necessity in winter, but seldom thinks of the miner and the mechanics of preparing it for use—for the home or for industry.

After determining the quality and quantity of coal in a specified property, also the market possibilities, then comes the advisability of developing the coal bed. Many factors govern the choice of a method of mining, as nearness to railroad; whether the coal can be best opened by stripping, drifts, slopes, or shafts; topography; thickness of coal; nature of roof and gas liberated; ventilation; water and drainage; haulage and hoisting systems; lighting; and electric drilling and undercutting, and mechanical loading of the coal blasted or shot down. In general, a bituminous coal mine can be planned easier than the average anthracite mine because in the latter, the

Four Years of Coal-Mining Taxes

Item	Amount	Anthracite	Bituminous
1. Companies with net income.....	158	3160	
2. Companies with no net income	280	6348	
3. Net income (1)	\$43,686,671	\$108,580,149†	
4. Deficit (2)	28,999,537	234,726,554†	
5. Deficit of industry (3-4)	28,999,537	234,726,554†	
6. Tax paid	4,849,865	11,117,936	
7. Total deficit (5+6)	9,837,269*	137,264,341†	

* Profit. In 1931, deficit of \$1,614,000, plus \$622,000 tax, equals \$2,236,000. † Loss.

32.5 cents in 1933, when the total amounted to \$5,783,000 and \$12,813,000 despite a large decrease in coal production.

coal is often steeply pitching or undulating. This makes mining more difficult, expensive, and hazardous. More than 90 percent of our coal is mined by under-

ground methods and in these operations, although as much as 95 percent is extracted, the average is not more than 70 percent.

Preparation for use.—The consumer may have coal that has been hand-picked and washed of its impurities, de-dusted before this treatment, and given a spraying with some material to prevent dust arising while coal, also coke, is being transported and handled in homes. All anthracite is carefully prepared and much of the bituminous coal. According to volume 39 of *Coal Age*, 1934, the capacity of screening and hand-picking methods installed or contracted for during 1933 was reported to be 6,770 tons an hour, and that for mechanical cleaning equipment about 5,575 tons an hour. Great quantities of coal are washed or otherwise prepared for making coke for blast-furnaces, foundries, and other industries.

Transportation of coal.—Because of its importance, we may repeat the statement that for many years the transportation of minerals has provided more than half of the railway traffic of the United States. Coal has contributed 35 percent or more of this proportion. Some figures are—465,000,000 tons of a total of 1,202,000,000 tons in 1920; 440,000,000 tons of 1,303,000,000 tons in 1929; 287,000,000 of 684,000,000 tons in 1933, according to the Interstate Commerce Commission and Bureau of Railway Economics. Coke is not included nor is the coal carried for the railways themselves, many millions of tons. For years, the freight rates on coal have exceeded the price that it received per ton at the mines. Recently, the railroads asked permission to increase these rates to as high as 20 percent more than at present. This, if granted, with the higher wages



In the Harlan County Coal Area, Kentucky

now being paid and the higher price of commodities, will add further burden to coal mining.

Labor.—The proposed 30-hour week (5 days of 6 hours each) will inflict much additional expense on coal producers (30 cents per ton in the Appalachian region), the railways and other agencies engaged in the handling of coal. Labor is already well paid for mining and preparing coal, having received a total of \$805,000,000 in 1929; and \$330,638,000 in 1932.

Coal competitors.—The decline in coal production in recent years previously

mentioned is attributed to competition with oil, natural gas, and water power, also to the more efficient burning of coal. The United States Bureau of Mines reports that of more than nineteen trillion British thermal units of energy developed during 1933, coal supplied 52 percent, oil 29 percent, natural gas 8 percent, and water power 10 percent. This oil includes gasoline, kerosene, and other products that more or less compete with coal. As to fuel economy, a blast-furnace uses far less coke, and a steam-electric power-plant and a steam locomotive consumes much less coal than prior to 1914—18 percent, 53 percent, and 19 to 27 percent, respectively, each being a good performance. In 10 years, the demand for anthracite has declined 42 percent. The principal cause is attributed to competing fuels, among which are bituminous coal and coke.

However, there is this to be said—coal can be burned for any purpose where oil, gas, and electricity are used, and long after the former are exhausted there will be coal to be mined. Edison is reported to have said in 1929: “* * * The first and best source of power is coal. * * *”

Bituminous Coal

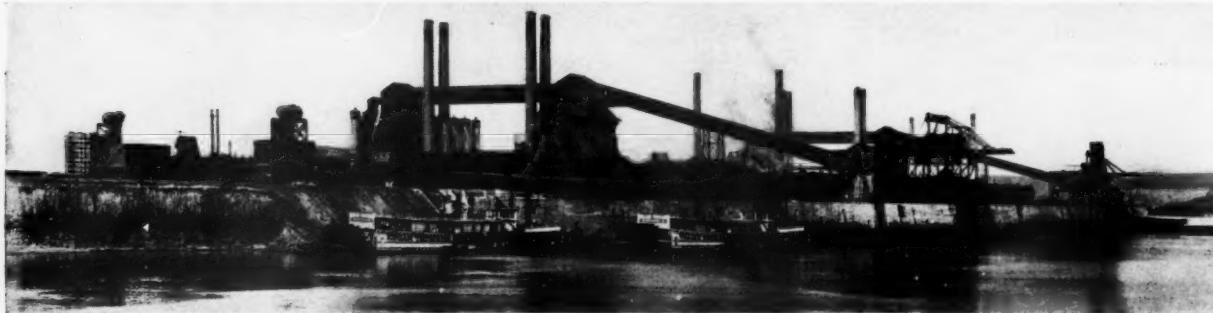
Sources of coal.—Following is the order of the states of greatest yearly (1929) production of bituminous coal: 1, Pennsylvania; 2, West Virginia; 3, Illinois and Kentucky; 4, Ohio; 5, Indiana; 6, Alabama; 7, Virginia; 8, Colorado; 9, Wyoming; 10, Tennessee.

Scale of operations.—The year 1929 shows what can be done: Production, 535,000,000 tons; average value at mines, \$1.78 per ton; stocks held by industries at end of year, 40,300,000 tons; average time worked, 219 days; men employed, 503,000; output, 4.85 tons per man-day;



A Coal Mine in Pennsylvania

THE ECONOMIC IMPORTANCE OF MINERALS



Probably the World's Largest Coking Plant, Clairton, Penn.

coal mined by stripping, 20,268,000 tons, working 411 shovels.

By 1933, the production had been cut to 306,000,000 tons, a slight gain over 1932; stocks were 32,700,000 tons; and employment was given to 419,000 men. During this year, West Virginia overtook Pennsylvania as it did in 1928, and Kentucky outstripped Illinois, not referring to stripping operations. During 1934, production rose to 358,000,000 tons.

The Department of Mines of Pennsylvania reports that of the 2,335 anthracite and bituminous mines, 1,363 were in operation at the end of 1933. This refers to those employing 10 or more men, but since January 2, 1934, all mines employing five or more men come within the law. In all, 117,000 men were at work at bituminous mines and received \$69,274,000 in wages.

In the 27 counties in which bituminous coal is mined in Pennsylvania there were 3,727,000 people in 1930. Twenty-two boroughs and cities with 182,000 persons depended on coal, also in 277 townships were 1,713 communities with 835,000 people.

By-Products of Bituminous Coal

A GENERAL idea of what comes or is produced from coal is the *Coal Products Tree* of The Koppers Construction Company. From the trunk are five main branches—coke, gas, light oil, ammonia, and tar. To mention a few of the hundred products, the coke finds uses in making gas and carbide, in metallurgy, as fuel; the gas yields illuminating gas, fuel gas, city gas, and cyanogen for many purposes; the light oil yields benzene, naphtha, resin, dyes, and antiseptics; the ammonia produces fertilizers and chemicals of varied classes; and the tar yields acids and phenols, fuels, explosives, medicinals, heavy oil, pitch, creosote, and refined tar. In all, more than 400 industries are listed.

Briquets.—Actually, a briquet may be of fairly fine raw or carbonized coal, compressed with some binding material as pitch, and is not strictly a by-product. Because the United States has so much household coal available, the making and burning of briquets is only a fraction of what it is in Europe. Some day, however, our lower rank coals must be briquetted. The output of briquets is irregular and has reached one and one-quarter million tons in a year, valued at \$8 a ton. Bri-

IN 1932, COAL (bituminous and anthracite)

Produced 355,567,000 tons valued at \$644,121,000.

Employed 401,796 wage earners, at an annual payroll of \$330,638,000.
(These figures do not include salaried employes.)

Paid Federal taxes of \$11,117,936. (State and local taxes not included.)
Anthracite in 1933 paid 32.5 cents a ton tax.

Furnished the raw material upon which more than 400 important industries are based.

Spent better than \$150,000,000 for equipment and operating supplies.
Furnished 35% of the revenue freight of the railroads.

Supplied 52% of the total 19-trillion B.t.u. developed.

It is estimated that bituminous and anthracite coal in all their ramifications, including by-product industries have more than 12-million persons dependent upon them for a livelihood.

Twenty-two States are major coal producers.

quets are also made from other carbonaceous materials as anthracite, char, oil-gas residue, and petroleum coke.

Coke.—Sixty million tons of coke, almost equal to the total output of copper ore, have been made in a year. Whereas formerly all coke was made in the wasteful beehive oven and its modifications, now, all but a small proportion is made in by-product ovens, which also yield gas, tar, oil, and fertilizer. A coking plant involves interesting operations—washing the coal, crushing and blending it, charging it into the ovens, pushing out the hot coke and quenching it with water, screening it for metallurgical and household purposes, the more or less complex equipment to take care of the gas and tar, also the making of the ammonium sulphate. Two-thirds of the coal charged is recovered as coke, therefore, to produce 60,000,000 tons of coke, 90,000,000 tons of bituminous coal is burned. In a busy year, a tenth of the coal mined is converted into coke and by-products, and more than 22,000 men are employed. The work can be hazardous, but injuries and fatalities are relatively few.

A coking plant makes six types or sizes of coke, each for a different purpose and ranging in price from \$2 to \$5.50 per ton. The whole product may average \$4.50 per ton. One of the interesting developments in recent years has been the steadily growing use of coke for domestic furnaces. This has exceeded 10,000,000 tons in a year. The

burning of coke requires a little more attention and skill than does coal, but those persons who use coke prefer it to coal.

Gas.—As mentioned, gas is the principal by-product from making coke. It is consumed in heating the ovens and is piped to steam boilers, and open-hearth and other furnaces in steel plants, to



A Dragline Excavation at a Strip Coal Mine in Illinois

THE ECONOMIC IMPORTANCE OF MINERALS

other industries, and to cities. Much of the tar from coke-making is also burned in open-hearths. During 1933, industrial by-product coking plants made 375,000,000 cubic feet of gas. Of this, 7 percent was burned for steam-raising, 25 percent in steel plants, 5 percent by other industries, and 23 percent by cities.

In addition to the foregoing, city-gas companies made 56,000,000,000 cubic feet of by-product gas, of which 90 percent was distributed through city mains to householders and other users. This gas was mixed more or less with other manufactured gas and with natural gas. For instance, the gas burned in Washington, D. C., has the approximate mixture of 80:20 manufactured:natural gas. In 1932, forty-two billion cubic feet of natural gas was used with manufactured gas in 11 states.

The foregoing refers to by-product gas—that is, gas whose production is of secondary importance to coke in coking plants and of primary importance in gas plants. In city gasworks much of the gas is made in large horizontal, sloping, or vertical retorts in which coal is distilled by heat from the burning of residual or by-product coke from the retorts. This gas is termed "coal gas." "Water gas" and "oil gas" are made in what are termed "generators," whose "blow" or flame has been noticed by persons living near or passing gas plants. Some salient features of the manufactured gas industry in 1933, as collected by Paul Ryan, of the American Gas Association, follow:

<i>Statistics of Manufactured Gas</i>	
Item	Quantity
Gas made, cubic feet:	
Water gas	154,029,000,000
Coal gas	29,533,000,000
Oil gas	10,488,000,000
Coke-oven gas	51,366,000,000
	245,515,000,000
(Actually, nine different kinds of gas are made. In 1929 the output was 313,710,000,000 cubic feet.)	
Distribution mains, miles	95,700
Fuel used, tons:	
Anthracite	132,000
Bituminous coal	7,829,000
Coke (made, 1,896,000; purchased, 684,000)	2,580,000
Oil (gallons)	527,925,000
Business:	
Gas customers	9,818,000
Gas sales (including purchased gas), cubic feet	339,542,000,000
Revenue	\$377,888,000

In the making of coke and gas many problems must be considered as sizing, washing, blending, and heating. After a number of years of careful and continuous research, the United States Bureau of Mines and the American Gas Association have just issued *Monograph 5* entitled *Gas, Coke, and By-product-making Properties of American Coals and Their Determination*, with A. C. Feldner and J. D. Davis as authors. The test data obtained from 29 coals, representative of the United States, and one coal from Canada, are given. All interested in the by-products of coal should have this publication.

Census summary of bituminous coal.—For the census year 1929 the Bureau of the Census issued the following details of the bituminous coal industry:

ITEM	QUANTITY
1. Enterprises in 29 states	4,976
2. Mines	5,620
3. Persons engaged (total of all classes)	482,541
4. Wage earners (average for year)	458,732
5. Coal produced, tons	537,443,000
6. Value of products	\$966,694,000
7. Principal expenses of operation and development	\$770,237,000
8. Wages paid (included in 7)	\$574,800,000
9. Cost of supplies, fuel and purchased energy (included in 7)	\$144,706,000
10. Development expenditure (included in 7)	\$16,646,000
11. Contract work (included in 7)	\$1,889,000
12. Machinery and other equipment purchased	\$34,947,000
13. Prime-movers (5171) and electric motors (66,581) driven by purchased energy, horsepower	3,124,000
14. Electric motors driven by energy generated by enterprises reporting	14,379

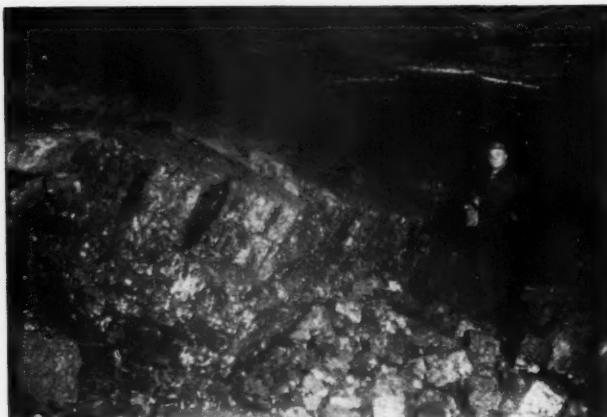
Money distributed by bituminous coal industry

STATE	VALUE OF PRODUCTS	PRINCIPAL EXPENSES	PERSONS EMPLOYED	MACHINERY AND EQUIPMENT PURCHASED
Alabama	\$38,565,000	\$33,761,000	26,039	\$1,505,000
Arkansas	6,173,000	4,771,000	3,880	180,000
Colorado	26,553,000	20,824,000	10,957	636,000
Illinois	114,618,000	90,220,000	52,196	7,491,000
Indiana	31,502,000	24,866,000	13,711	1,073,000
Iowa	11,833,000	9,801,000	6,368	146,000
Kansas	6,953,000	4,819,000	3,716	264,000
Kentucky	95,658,000	80,448,000	57,912	2,713,000
Maryland	4,745,000	4,144,000	3,202	50,000
Missouri	9,668,000	7,179,000	5,066	907,000
Montana	7,448,000	4,945,000	2,154	591,000
New Mexico	8,324,000	6,182,000	3,324	126,000
North Dakota	3,207,000	1,932,000	1,175	80,000
Ohio	36,916,000	31,327,000	22,868	1,044,000
Oklahoma	10,790,000	8,774,000	5,016	235,000
Oregon	85,000	69,000	40	
Pennsylvania	262,457,000	208,168,000	126,321	7,912,000
Tennessee	9,369,000	8,164,000	7,287	178,000
Texas	1,674,000	1,223,000	1,309	48,000
Utah	13,146,000	9,674,000	3,746	754,000
Virginia	21,162,000	16,730,000	12,478	753,000
Washington	8,640,000	5,985,000	2,977	183,000
West Virginia	217,023,000	171,765,000	104,349	7,745,000
Wyoming	17,119,000	11,689,000	4,903	321,000
Other states*	3,078,000	2,777,000	1,547	12,000

* Arizona, Georgia, Michigan, North Carolina, South Dakota.

Census summary of anthracite.—For the census year 1929 the Bureau of the Census issued the following details of the anthracite industry:

ITEM	QUANTITY
1. Enterprises in Pennsylvania	198
2. Mines	303
3. Persons engaged (total of all classes)	150,494
4. Wage earners (average for year)	142,801
5. Coal produced, tons	74,546,000
6. Value of products	\$384,854,000
7. Principal expenses of operation and development	\$313,401,000
8. Wages paid (included in 7)	\$229,967,000
9. Cost of supplies, fuel, and purchased energy (included in 7)	\$57,295,000
10. Development expenditure (included in 7)	\$7,902,000
11. Contract work (included in 7)	\$6,802,000
12. Machinery and other equipment purchased	\$5,580,000
13. Prime movers (3666) and electric motors (6598) driven by purchased energy, horsepower	1,041,000
14. Electric motors driven by energy generated by enterprises reporting	9,917



Mass of Bituminous Coal Blasted Down in West Virginia

Anthracite

THIS Journal for February, 1935, carried a brief though good summary of the status of anthracite, as viewed by T. M. Dodson. He showed an overall shrinkage of 40 percent for the industry in 10 years, and gave the causes. This referred to Pennsylvania, which produces the bulk of the anthracite; but the sizable output (up to 840,000 tons in a year) from Arkansas, Colorado, New Mexico, and Virginia, should not be overlooked, yet their coal does not affect the market for the Pennsylvania product. The consuming area for its anthracite are the six New England states, the three middle Atlantic states, and south Atlantic states, the five east north-central states, and Minnesota, which is west north-central. In 1930 their combined population exceeded 64,000,000, almost double that of 1890. Ninety-five percent or more of this fuel is used for domestic purposes.

Range of Operations.—Since 1923, and down to 1933, the anthracite industry of Pennsylvania has ranged as follows in a year: Production, 83,300,000 tons valued at \$6.77 per ton and 49,500,000 tons valued at \$4.46 per ton; exports 4,500,000 tons and 322,000 tons; coal mined underground, 83,000,000 tons (1933); average time worked, 268 days and 182 days; coal per man-day, 2.20 tons and 2.60 tons; men employed and wage per man, 154,209 and \$1,768 and 98,761 and \$1,138; total wages paid, \$272,720,000 and \$112,366,000; coal mined by stripping, 2,020,000 tons and 4,930,000 tons; coal recovered from rivers by dredges, 385,000 tons and 322,000 tons; coal mined underground, 81,900,000 tons and 44,300,000 tons. The range of operations of individual companies is 500 to 20,000 tons per day.

During 1934, production rose to 57,000,000 tons.

As to costs, labor increased from \$1.43 per ton in 1914 to nearly \$3.70 in 1924; supplies, depending on local conditions, cost between 50 and 60 cents per ton; power may cost 20 cents per ton.

The total of wages, supplies, and power, using 1933, would amount to

000 people were dependent on anthracite.

Luzerne County, Pennsylvania, contains half of and produces 40 percent of the anthracite. Wilkes-Barre is the county seat and is the metropolis of Wyoming Valley, an area of 125 square miles. The county has a population of 445,000 or more. A tenth of these is engaged in mining and a large number, especially women, is employed in industries resulting from the coal deposits. The total pay roll in Luzerne County in 1932 was \$73,179,000, \$55,000,000 coming from mining.

The Scranton Chamber of Commerce reports that of its 27,000 males at work in January, 1935, half of them are engaged by 15 mine operators. Seven railroads employ nearly 6,000 men. A large number of industries have been developed in this district.

Acknowledgment is due to E. W. Parker, secretary of the Anthracite Institute for his cooperation.

GAS—Natural

WE DISCUSSED manufactured gas under "Coal," its proper place, but at this point will say that whereas the output of gas wells is four times that of gas plants, manufactured gas serves more people than natural gas. The following tabulations, from the American Gas Association (A. G. A.), shows this:

The A. G. A. has a list of 58 industries in which gas is used in 500 different operations, some of these closely con-

\$150,000,000 a year distributed in the anthracite region.

The anthracite region.—Ten counties with a total population exceeding 1,466,000 persons produced anthracite in 1933, according to the Pennsylvania Department of Mines. Fifty boroughs and cities with say 700,000 people and 45 townships with 315 communities and more than 200,-cerning the individual. We can hardly do without it.

Source of Natural Gas.—Fifty thousand wells in 24 states are the source of the natural gas, and 15 states yield most of it. In order of greatest production are Texas, Oklahoma, California, Louisiana, West Virginia, Pennsylvania, Ohio, Wyoming and Kentucky. Gas wells range from 500 to 5,000 feet or more in depth, but the average is around perhaps half of this maximum. A well may yield a quarter million cubic feet of gas a day or many million cubic feet, much of it at high pressure. Through lack of control, the wastage of gas is enormous—billions of cubic feet a year. A large part of this wasted gas is termed "sour," which means it contains hydrogen sulfide, but there is a process for making it "sweet."

Production and Transportation.—The United States has produced 1,943,000,000,000 cubic feet in a year—in 1930, but at the present rate is 400,000,000,000 cubic feet less. From the wells it is moved to points as distant as 1,000 miles by 50,000 miles of pipe. There is considerable inter-State movement of gas, as much as 20 percent of the output.

Principal Uses.—Natural gas finds its chief utilization in the field, in making carbon black, in public-utility power plants, at petroleum refineries, in portland cement plants, and in miscellaneous industries. According to Paul Ryan, chief statistician for the American Gas Association, there were 5,500,000 customers in 1933 and they purchased 818,231,000,000 cubic feet of gas, this bringing in \$302,000,000. Domestic users paid \$197,600,000 of this.

From natural gas is extracted large volumes of the gasoline consumed by motor vehicles. Approximately 95 percent of the gas is treated for natural gasoline which yields 0.1 percent of gasoline. Roughly, 1,000 cubic feet of gas gives 1 gallon of gasoline. Other gasoline is extracted from the distillation of petroleum.

Federal, State and local taxes are imposed on the retail sale of gasoline. They are in the nature of sales or consumption taxes levied primarily for highway construction.

The carbon black mentioned above finds extensive use in our inks and tires.

Comparison of Manufactured Gas and Natural Gas Industries in 1933

Item	Manufactured gas	Natural gas
Companies	550	1,435*
Employees	71,000	48,200
Annual pay roll	\$104,784,000	\$63,000,000
Taxes paid:		
Federal	8,112,000	3,657,000
State, local, and others.....	35,532,000	23,018,000
Total.....	\$43,644,000	\$26,675,000
Communities served†	3,192	4,650
Population served	50,170,000	28,700,000

* Includes 289 producers and 75 pipeline companies.

† At December 31, 1931.

LIME

LIMESTONE is mentioned under the Stone Industries, reference there being made to its extensive use in building stone, as crushed stone, as flux, and in making cement. Limestone as lime finds much use in agriculture, building mortar, chemical industries, glass, and water purification, to mention a few outlets. More than 4,000,000 tons valued at \$8 a ton have been made in a year in more than 400 plants. Ohio is the leading state, followed by Pennsylvania, Missouri, West Virginia, Alabama, and Virginia. It can be seen that a large number of men and considerable equipment are employed in this essential industry.

PETROLEUM

IN 1934, at Titusville, Pennsylvania, was held the 75th anniversary of the first oil-well of the United States. This was drilled by Edwin L. Drake and struck oil at 69½ feet. Since then, this country has produced more than 16,000,000,000 barrels of petroleum, equivalent to two-thirds of the world's total, and, it may be said, Americans have taught the world how to prospect, drill, produce, refine, and transport petroleum and its products. According to V. H. Scales, director of the Department of Public Relations of the American Petroleum Institute, the present capital investment exceeds \$12,000,000,000 and there are 2,000,000 shareholders; 1,250,000 men are employed and are paid \$1,500,000,000 annually, and 6,000,000 people are directly dependent on the industry for support. To the extent of about 28 percent the United States depends on crude oil for the energy generated, this including fuel oil, gasoline, kerosene, and other products therefrom; for the power in motor vehicles; for warships, steamships, motorships, and locomotives; for lubrication; for illuminants; and for many other necessities of daily life, too numerous to list here. The use of petroleum products continues to grow.

Uses.—Motor fuels and lubricants not only permit the movement of vehicles over the roads, but the many taxes levied upon them finance the construction of those roads. Petroleum asphalt paves the streets of many a city. Asphaltic mate-

rials and road oils are finding increasingly greater use for improvement of main highways and rural roads. It is probable that in the near future the possibility of improving farm roads so inexpensively with these materials will not only serve to make mud a memory, but to put every farm in the United States in close touch with that farm's city market.

Petroleum products fueling and lubricating farm machinery have expedited the replacement of muscles by motors in the agricultural industry, released for profitable crops millions of acres formerly used for raising food for work animals, and shortened the farmer's hours of labor. About one-fourth of all the motor-trucks in the United States now are in use of the farms. There are also 1,000,000 tractors, 5,000 Diesel motors, 300,000 lighting plants, and innumerable washing-machine motors, farm

marketed for internal use. Petroleum in various forms becomes an ingredient of solvents, creams, ointments, and jellies. A series of petroleum alcohols find use in hospital and home, these being necessary to the manufacture of lacquers, soaps, and essential oils.

Petroleum insecticides within recent years have made the world less happy for insect pests. Petroleum waxes and paraffins are used in packing fruits and eggs and in the manufacture of candles. They facilitate laundry operations, and preserve jams and jellies. Saturating wax goes into the manufacture of brushes, electrodes, and other carbon products.

The petroleum industry is among the largest consumers of steel, iron, motor vehicles, meters, gages, pipes, stationary engines, rubber, brass, tin, chemicals, rope, wire, cable, cement, tools, valves and other products.

Taxes Paid.—One billion dollars is the petroleum industry's contributions to the financial support of the Government. Some of the oil-producing states draw more than half of their entire tax revenue from it. Taxes upon the industry's most popular product, gasoline, are so heavy as to enable the Government to collect more in revenue than is made in profits on gasoline sales.

Every product and property and every operation and service of the industry is taxed at least once by some unit of Government. In all, there are 118 types of taxes, and the total is equivalent to \$1,000 per employee. A recent report of the Petroleum Administrative Board said the cost of producing a barrel of crude oil in recent years averaged 80.6 cents per barrel, while the average market price was 72 cents. Taxes on that barrel and its products, however, amount to \$1.11, of which the public paid about 90 cents.

When one considers that in the past it has been accepted policy to tax heavily only those products whose use, for one reason or another, it was generally regarded advisable to discourage, it is enlightening of a changed attitude to discover such heavy taxes upon a commodity so essential and so widely used as is petroleum. The table shows in some detail the estimated tax bill of the industry in 1933.

machine-shops, milk-cooling units, irrigation plants, and other machines performing work once done by man or animal, and all dependent upon petroleum fuels and lubricants.

Petroleum and asphaltic products find use as roofing materials, paints, anti-acid coatings, insulation, molding compositions, and in compounding rubber products. Used for ages as a cure for the ills of man and beast, petroleum still occupies no unimportant place in the field of medicines. Tasteless distillates are



A Well-Drilled and Spaced Oil Field in Oklahoma

THE ECONOMIC IMPORTANCE OF MINERALS

In the 13 years of 1921 through 1933, the total tax bill of the industry is estimated at \$5,867,115,857, or about 2½ times its net earnings of \$2,198,039,974. During that period, taxes on gasoline sales alone totalled \$3,783,549,269, an amount which was increased an estimated \$730,000,000 by collections in 1934.

The gasoline tax probably is the heaviest sales tax of the day. In 1933 the average retail price of gasoline was 13.64 cents / gallon. The average of State and Federal taxes was 5.2 cents, representing a retail sales tax of nearly 40 percent.

State gasoline taxes are estimated to have cost the public \$560,000,000 in 1933, and Federal gasoline taxes an additional \$170,000,000. County and city gasoline taxes also are levied in some States, but their total cost is unknown. The effect of these cumulative taxes is to make the tax total actually higher than the retail price of gasoline.

Collection of these levies is made the responsibility of the industry, and largely at its own expense. At the same time the industry is forced to compete with gasoline bootleggers and tax evaders who find in escaping taxation an opportunity to increase their profit margins or to attract trade by price-cutting. Their operations in the past few years have cost the legitimate gasoline business the loss of extensive trade and have cost the States millions of dollars of revenue.

Source of Petroleum.—Oil production is an industrial undertaking in 22 States, divided as follows: the California district; the Rocky Mountain district of Montana, Wyoming, Utah, Colorado and New Mexico; the Mid-Continent district of Kansas, Oklahoma, Texas, Arkansas, Louisiana and Mississippi; the Gulf Coast district of Texas and Louisiana; and the Eastern district of Illinois, Indiana, Kentucky, Ohio, West Virginia, Pennsylvania and New York.

Total oil production from the 350,000 oil wells of these States has exceeded 1,000,000,000 barrels a year, but normally is about 900,000,000 barrels. Texas (which has the world's greatest oil field) has the largest production, with Oklahoma second, and California third. Kansas, Louisiana, and New Mexico follow in order. The output of the six leading oil-producing States proportionately is as follows:

State	Barrels	Percent of total
Texas	402,000,000	44
Oklahoma	182,000,000	20
California	172,000,000	19
Kansas	42,000,000	4
Louisiana	25,000,000	2.7
New Mexico	14,000,000	1.5

Nature's generous endowment has enabled many States to produce more oil than some countries. Texas, Oklahoma, California, and Kansas, for instance, have given the world more oil than all foreign countries together. Texas alone has produced more oil than Mexico, Rus-

Petroleum Industry Taxes in 1933		
Form of tax	Total tax	Taxes, cents/barrel
State gasoline taxes	\$518,195,712	57.26
Federal gasoline taxes	181,125,988	20.00
Real and personal property taxes	130,000,000	14.36
Incomes taxes (Federal, state, and city)	50,000,000	5.52
Severance taxes (state, county, and municipal)	22,625,000	2.50
Federal lubricating oil taxes	22,289,624	2.46
Federal pipeline transportation taxes	10,237,274	1.13
Municipal gasoline taxes	10,000,000	1.10
State registration and license fees on tank-trucks, etc.	10,000,000	1.10
Capital stock tax	9,955,000	1.09
Federal and state excise taxes on tank-trucks and other vehicles	7,952,380	0.90
Federal taxes on new tires for old tank-trucks, etc.	4,132,660	0.46
Corporation franchise, stock, and mercantile licensing and inspection taxes	3,620,000	0.40
State inspection fees, drilling permit fees, etc.	3,620,000	0.40
Federal taxes on parts and accessories for tank-trucks	633,120	0.07
State sales taxes on tires for tank-trucks, etc.	437,270	0.05
Other taxes	20,000,000	2.21
Total	\$1,004,824,028	\$1.1101

sia's output has been exceeded both by California and Oklahoma. Arkansas has yielded more oil than either Rumania or Persia, and Wyoming more than Venezuela.

Oil-well drilling was slow, laborious work of months when the Drake well was sunk at the rate of three feet a day. Modern drilling machinery, employing both cable-tool and rotary methods, and using steam, oil, or electric power, sink wells within a few weeks, sometimes days. In normal years some 20,000 wells are drilled in this country at a cost of, roundly, \$500,000,000.

Deep drilling, re-pressuring and acid treatment of rocks probably will become important factors in augmenting the country's oil supply. Deeper wells may find more oil at greater depths; re-pressuring, by introducing gas or water pressure into sands supposedly drained of their content, makes recovery of additional oil possible. Some study has been made into the possibility of mining oil sands, but the problem is difficult.

Although real progress has been made in oil exploration and in the science of finding oil, its actual presence still is proved only by the drill. This situation makes drilling somewhat speculative, although an average of three of every five wells drilled strike oil. Others may be gas wells, or dry. Scientific research steadily is reducing the chances of loss.

In the technique of petroleum production and refining, great scientific and engineering feats have been accomplished—in the geophysical, geological, and mineralogical investigations of occurrence; in drilling to as deep as 11,377 feet; in refining; in transportation, and in the efficient uses of oil and its products.

Transportation.—Petroleum and its products are moved to places for refining and for consumption by pipelines, railroad tank-cars, motor tank-cars and tank-ships, and barges. The first mentioned are buried and are, therefore, not seen, but the other carriers are seen every day. Of pipe-lines there are 111,000 miles, holding 23,000,000 barrels; approximately half are gathering lines and half are main lines. The industry is the largest buyer of tank-cars, of which it has 190,000, and the second largest buyer of tank-ships, which constitute nearly 20 percent of the United States merchant marine. Despite the operation of its own extensive transportation system, it ships by rail a greater tonnage of manufactured products than any other industry. During 1929, according to the Interstate Commerce Commission, refined petroleum and its products totaled 64,240,000 tons, or about 5 percent of all rail traffic. This is one-eleventh of the products of mines, including a fractional proportion of crude petroleum.

Refining.—In its simplest form, the process of petroleum refining consists in heating the crude oil in a still to its boiling point, then passing the vapors from the boiling oil through condensing pipes and converting the vapors into



Experimental Oil-Shale Mine and Plant in Colorado

liquids. The flow-chart of a modern refinery is more or less complicated, involving many processes utilizing heat, cold, pressure, and turbulence. From 100 gallons of crude oil the approximate yield is 44 gallons of gasoline; 36 gallons of fuel oil; 8 gallons of road oil, paraffin wax, asphalt, and coke; 6 gallons of kerosene; and 3 gallons of lubricants; the loss is 3 gallons.

Petroleum refining, like production, is essentially American. Until recently our petroleum industry has operated 85 percent of the world's refinery capacity. Our refining methods have been adopted around the world, and with the flow of crude oil to other countries, resulting from the imposition of an United States tariff upon imports, have come into general use abroad.

Currently, there are in operation in 35 States approximately 500 oil refineries with a total daily capacity of 3,500,000 barrels. The annual output of manufactured products of these refineries has an estimated market value of \$1,500,000,000, or slightly more than twice the estimated value at the well of the annual output of crude oil. Refinery output normally includes some 400,000,000 barrels of gasoline, 60,000,000 barrels of kerosene, 400,000,000 barrels of gas and fuel oils, 34,000,000 barrels of lubricants and millions of barrels, tons, and pounds of other products.

It is the aim of modern refinery practice to extract from crude oil the greatest possible quantity of highest quality products. Within the past 20 years, for instance, the amount of gasoline obtained from a barrel of crude oil has been doubled. In recent years, refinery technologists have successfully endeavored to produce motor fuels and lubricants (the refined products for which demand currently is largest) definitely adapted to satisfactory use in modern motor vehicles.

Developments now under way in the refining field seek the production of satisfactory refined products from virtually any grade of crude oil, and the introduction of such flexibility into refinery operations that a larger output of that product for which demand is greatest may be obtained without undue waste or excessive production of other products. The refiner heretofore has been dependent upon certain grades of crude oils in producing certain refined products, and was directly affected by over or under-production of those grades. This situation, with lack of flexibility in refinery operations, tended to transfer to the refining industry the same over-production that troubled the producing branch of the industry, and not infrequently created a situation whereby there was an excess of some products, a shortage of others, with the refiner powerless to adjust output to demand.

Products of Refining.—In refining petroleum, there are six principal products—(1) hydrocarbon gases, (2) light distillates, (3) intermediate distillates, (4) heavy distillates, (5) residues, and (6)

sludges. On further treatment (1) yields liquified gases, petroleum, ether, alcohols, gas black, fuel gas, and light naphthas; (2) yields naphthas and refined oils; (3) yields gas oil and absorber oil; (4) yields technical heavy oil, wax and lubricating oil; (5) yields lubricating oil, petrolatum grease, residual fuel oil, still wax, asphalts, oil-soluble sodium sulphonate, and coke; and (6) yields acid coke, sulphonic acid, heavy fuel oils, and sulphuric acid. These six secondary products yield more than 150 other products, many of which are known to every person.

In refining, the industry consumes as fuel large quantities of natural gas, still gas, oil, petroleum coke, and sulphuric acid. Of the first, more than 100,000,000,000 cubic feet has been used in a year. Perhaps as much as this of still gas from refining is used as refinery fuel.

Future of Industry.—According to the report of the Planning Committee for Mineral Policy, 1934, at present the proved reserves of oil recoverable by the usual methods of production are estimated to be about 13,000,000,000 barrels.



A Phosphate Pit in Florida

country that possesses oil reserves of major importance.

Serious losses of this indispensable, irreplaceable, limited resource (petroleum, also gas), some of which are unavoidable under conditions that prevailed in the past, have accompanied development.

The present daily output is around 2,500,000 barrels and stocks total 323,000,000 barrels.

PHOSPHATE ROCK

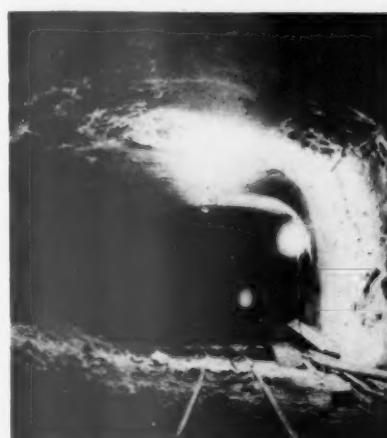
THE mining of phosphate rock in Florida, Tennessee, Idaho, and Montana is of importance to those states and to the nation because of its broadcast use as a fertilizer after it has been prepared and treated with sulphuric acid. All of the pebble deposits of Florida and the brown rock of Tennessee are mined by surface methods, and those from the West by underground operations. Florida has accounted for 80 percent of all the phosphate rock produced, followed by Tennessee with 17 to 20 percent. In a busy year, 3,800,000 tons have been mined, 3,200 men employed, 104,000 hp. used, and \$13,000,000 the value of the products.

POTASH

BECAUSE the United States can be independent of outside sources of potash, this mineral should be placed among the major non-metallics. Each year, provided that general business is good, the output of potash from the new mines should increase. When compared with the two leading European countries, our output is small. Potash is converted into a number of important salts, mostly used as fertilizers. The mines of New Mexico and Texas and the brines of California provide a growing and important industry.

THE STONE INDUSTRIES

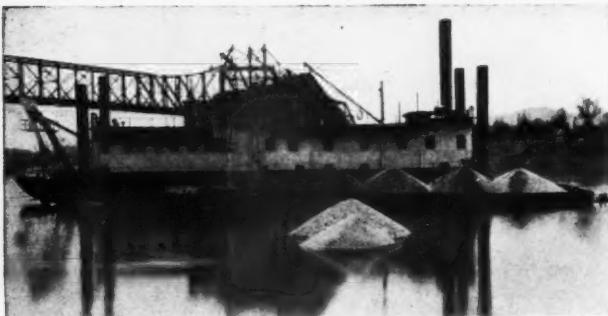
THE above caption is the title to Oliver Bowles' 519-page book, published in 1934 by McGraw-Hill Book Company. It has two main divisions—dimension stone, its geology and technology, and crushed stone, its distribution and utilization. Dimension stone means boulders, granite, limestone, marble, sandstone, slate, soapstone, and miscellaneous rocks and minerals for buildings, paving, curbing, and monuments. Crushed stone means basalt or traprock,



In a New Mexico Potash Mine

These would last approximately 15 years at the 1933 rate of consumption. However, as some of the oil included in these reserves cannot be produced until 20 or 30 years hence (because of the decline in rate of production as a well grows older), a shortage during the coming 15-year period can be prevented only by discovery of new fields. New production to postpone the day of shortage will no doubt be found, but sooner or later the Nation's output of oil from wells will be insufficient to meet the demand. The United States is depleting its supply of oil at a more rapid rate than any other

THE ECONOMIC IMPORTANCE OF MINERALS



Dredging Sand and Gravel From the Ohio River at the Rate of 500 Tons an Hour

granite, limestone including marble, and sandstone including quartzite and miscellaneous for roads, concrete, and ballast. The two industries have little in common, except that both employ rock as raw material. Explosives are used sparingly in cutting out dimension stone, but considerable in getting stone for crushing to sizes required. There are comparatively few quarries for dimension stone, whereas those for crushed stone are numerous throughout the country. The latter industry has competitors in natural gravel, as from river and land deposits, and from smelter slags.

Dimension Stone.—The dimension stone industry accounts for a total value of \$80,000,000 in a busy year. Of this, granite, which occurs mostly in the east and west, is valued at \$22,000,000; limestone—Indiana producing more than 80 percent, \$21,500,000; marble—mainly from Tennessee, Vermont, and Georgia, \$16,500,000; sandstone—widely distributed, \$5,300,000; slate—principally Pennsylvania and Vermont, \$12,500,000; and soapstone—Virginia, \$1,300,000. Analysis, color, workability, and resistance to weathering are some of the essential properties of building stones.

The construction industry of the United States makes big figures in a busy year. *Minerals Yearbook, 1934*, lists \$6,630,000,000 for 1928—public works, public utilities, non-residential and residential contracts awarded; also engineering construction totaling \$3,580,000,000.

Crushed Stone.—Of the 188,000,000 tons of crushed stone produced in this country in 1929, 80 percent was limestone, about a tenth of that was basalt, a fifteenth was granite, and a thirtieth was sandstone. The total value exceeded \$90,000,000.

Of the lime rock sold in 1930, a half was used as crushed stone, nearly a third in making cement (nearly 27,000,000 tons made that year) an eighth as flux, a twentieth as lime, and the remainder in chemical and many other industries. Limestone suitable for the crushed-stone industries occurs in every State.

Excepting California, most of the

New York, and Pennsylvania, in order.

Concrete pavement contracts awarded in 1928, in which crushed stone and cement are used, totaled 148,000,000 square yards, according to the Portland Cement Association.

Through A. T. Goldbeck, director of its Bureau of Engineering, the National Crushed Stone Association reports that



Mining Slate in Pennsylvania by Means of a Wire Saw

approximately there are 1,800 stone-producing companies in the United States (some of them also produce gravel), operating 2,000 plants. There have been as many as 27,300 wage-earners in a year (1927), but there were 10,000 less than this number in 1933. Administrative, clerical, and sales employees would add a fifth to the total. In 1929, 25,346 employees are estimated to have received \$19,600,000 in wages. The crushed-stone industry more or less influences almost every other industry—highways, railways, buildings, automotive transportation, construction equipment, and machinery, power, chemical and other manufacturing industries.

Sand and Gravel.—We have placed sand and gravel under The Stone Industries. They are more or less part thereof, especially sand as used in mortar and concrete, and gravel as a competitor of crushed stone.

Through C. E. Proudley, research engineer, the National Sand and Gravel Association has contributed some instructive information, as follows: At the beginning of January, 1935, there were approximately 3,400 companies producing sand and gravel in the United States. A fifth to a quarter of these operate two

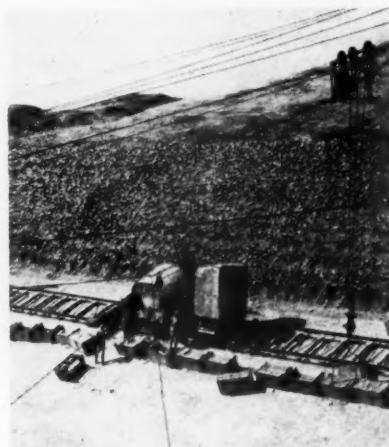
or more plants, sometimes in several States, so that they represent around 5,000 plants. These range in production from a few cubic yards to more than 1,000,000 tons a year. During 1933, at least 13,000 persons were employed on a typical day, but in better years this number would be doubled. The census report for 1929 gave 19,666 persons employed (15,994 on wage and 3,672 on salary), and 18,885 wage-earners on a typical day. The estimated pay roll for 1929 is \$27,800,000 as wages and \$13,100,000 as salaries, and for October, 1934, \$10,570,000 and \$4,980,000 respectively. Two hundred and five million tons has been the record output of sand and gravel in 1929, valued at \$116,000,000. By 1933 these figures had dropped to approximately a third.

With regard to the number and size of communities really dependent upon enterprises of the sand and gravel industry, the plants connected therewith invariably grow with the community as a local supply rather than the principal business. There are factory towns

whose prosperity might be considerably affected by the economic conditions of a plant or the quality of its product, such as in the making of glass; but in general, sand and gravel are naturally so widely distributed and so low in price that few, if any, communities are actually dependent on the existence of any single plant. Sand and gravel are used to some extent by most major industries and readily available supplies of good quality are a valuable mineral resource.

As to the major industries dependent on the products of the sand and gravel industry, the shown tabulation has been compiled by the National Sand and Gravel Association.

A careful estimate of the power equipment used in the industry gives 630,000 horsepower and of the annual cost of power, including fuel and purchased en-



Cutting Out Bricks of Diatomite From the Solid in California

THE ECONOMIC IMPORTANCE OF MINERALS

ergy, \$10,871,000. Also, the equipment purchased in 1929 exceeded \$14,000,000. The upturn in business should require purchases somewhat beyond normal.

In connection with the excavation of sand and gravel, the Bureau of Mines has published two of a series of three reports on the subject, as *Information Circulars*. They discuss the use of the power-shovel, dragline, excavator crane, power-scraper, slackline cableway excavator, hydraulic monitor and dredges.

STONE, SAND AND GRAVEL

INDUSTRIES in a normal year employ approximately 45,000 wage earners, who earn \$60,500,000. This represents 7,000 plants. In 1929 these plants spent more than \$14,000,000 in equipment purchased.

The census for 1929 found that in the quarrying of basalt, granite, limestone, marble, sandstone, and slate, and miscellaneous stone there were 2,249 enterprises, with 2,458 quarries. These employed 62,966 persons of whom 56,835 were wage-earners. The value of the 177,755,000 tons of primary products was \$194,675,000, plus \$1,320,000 for secondary products. This gives an average of \$1.10 per ton. Of the principal expenses of \$126,847,000, 55 percent was paid as wages, 24 percent for supplies, and 10 percent for fuel and purchased electric energy. Pennsylvania accounted for 14.6 percent of the total value of products, then New York with 7.3 percent; Ohio, 6.8 percent; Indiana, 6.4 percent; Michigan, 5.8 percent, and Vermont, California, Massachusetts, Illinois, and Missouri with around 4½ per cent. Limestone, with \$86,226,000, far outstripped

Relation of Sand and Gravel to Other Industries

Industry	Estimated employees	Estimated weekly pay roll
Construction:		
Building	158,681 (excluding private)	\$3,125,000
Roads	229,774	2,140,000
Glass	60,100	1,160,000
Cut stone, slate, and others.....	11,400	216,500
Fottery	25,900	425,000
Blast-furnaces, smelting, molding, and other	627,900	12,206,500
Traction (Class I railroads)....	1,066,361	121,368,674
Total.....	2,180,116	\$140,641,674



Quarrying Limestone in Indiana



Loading Trap-Rock or Basalt in New York

the value of the other products, in fact it represented just half.

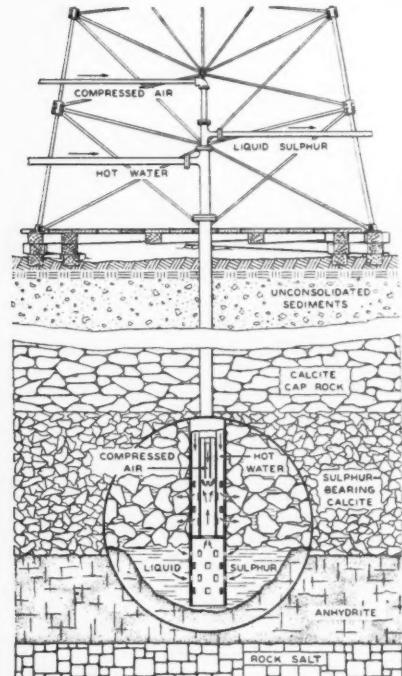
SULPHUR

THE DEPOSITS of sulphur in Louisiana and Texas, with that contained in sulphide minerals (mainly pyrite of 35 percent sulphur content) from California and Virginia and some importations, enable us to make various chemicals, fertilizers and insecticides, paper pulp, explosives, hard rubber, and miscellaneous products. Sulphur as sulphuric acid is the base of most of these manufactures, the first three listed using 40 per cent or more, 20 percent or more, and 20 percent, respectively, of our sulphur production. The United States is independent of foreign sources of sulphur and could be of imported pyrite which contains 45 percent or more of sulphur. Some of the sulphides come from the concentration of copper and zinc ores in Colorado, Missouri, Montana, and Tennessee, the concentrates being roasted and smelted, and acid recovered from the fumes.

The sulphur industry of the United States is of great importance, and al-

THE ECONOMIC IMPORTANCE OF MINERALS

though the total output may exceed \$40,000,000 in a year, that does not mean its intrinsic value by a great sum. It has been termed "an industrial necessity." The sulphur producers, as the Duval Texas Sulphur Company, Freeport Sulphur Company, Texas Gulf Sulphur Company, and The Jefferson Lake Oil Company are liberal with information. Their deposits lie at depth of 500 to 1,500 feet where the sulphur occurs as crystals in limestone and gypsum.



Showing Sulphur-Well Piping

Drill-holes are put down and super-heated water is pumped into the formation, melting out the sulphur and bringing it to the surface, 99½ percent or more in purity. Extensive equipment, particularly in boilers and means of pumping great volumes of water, is necessary. One plant has been built on a swamp, requiring considerable engineering skill. More than 2,000,000 tons has been thus extracted from the ground in a year.

In California and Utah, sulphur occurs in volcanic rock which is mined, and the ore is either crushed and steamed or crushed and floated to recover the sulphur.

Operations in Louisiana and Texas may be tabulated as shown.

MINOR NON-METALLIC MINERALS

ALTHOUGH they are important, abrasives, arsenic, asbestos, barite, feldspar, fluorspar, gypsum, magnesite, mica, salt, silica, and talc may be considered a minor group. Their output and value have been given earlier in this review. From the Census for 1929 we give some particulars of certain of them:

Summary of Sulphur Mining Operations in Two States

Item	Louisiana	Texas
Productive mines	2	6
Men employed	640	1,500
Annual pay roll	\$1,028,000	\$2,170,000
Annual taxes paid (local, state, Federal)	(*)	\$3,500,000
Communities dependent on sulphur mining	3	6
Approximate population of these towns	4,000 †	6,000
Fuel, power, supplies, and equipment purchased	1,730,000	

* Incomplete

† Mostly dependent on the industry, also two other towns totaling 12,000 persons, partly dependent.

Details of Some Minor Non-Metallics

Minerals	Mines	Wage-earners	Output, tons	Value	Principal expenses
Abrasives	26	462	90,000	\$1,412,000	\$905,000
Asbestos	11	195	3,400	397,000	349,000
Barite	44	844	272,000	1,801,000	1,062,000
Feldspar	58	598	205,000	1,935,000	1,048,000
Fluorspar	36	1,053	156,000	2,858,000	2,222,000
Gypsum	63	2,078	5,152,000	5,740,000	4,157,000
Magnesite	5	351	98,000	2,043,000	1,150,000
Mica	32	226	12,130	516,000	354,000
Salt . . . . .	..	..	8,543,000	27,334,000	..
Sand (glass)	32	1,030	2,186,000	5,359,000	2,868,000
Sand (molding)	128	1,037	4,223,000	4,776,000	2,679,000
Silica	73	1,433	1,334,000	4,645,000	3,099,000
Talc and soapstone	28	632	243,000	2,688,000	1,508,000

WHAT OTHERS THINK OF THE MINERAL INDUSTRY

IOTHERS have thought and are thinking along similar lines as THE MINING CONGRESS JOURNAL on the national importance of our minerals. In his *Man and Metals* (McGraw-Hill Book Company, 1932), T. A. Rickard traces the use of metals through several thousand years and concludes by saying:

In the great work of opening the dark places of the earth and of introducing civilization among the backward peoples, the miner has been the prime agent. * * * his pioneering has helped mankind forthwith. * * * So Africa remained the dark continent. * * * The

prairies between the Mississippi and the Rocky Mountains, the sagebrush plains and the alkaline deserts beyond them, were traversed by hunters and traders, by soldiers and artisans, even to the shores of the Pacific, but theirs was an empty conquest and a vain annexation until the miner spoke the word that unloosed the springs of human industry. He was not only the pioneer, but he left marks to show the way; he blazed the trail for civilization. * * *

In the Bulletin of the Canadian Institute of Mining and Metallurgy for February, 1935, R. C. Rowe has an essay



Shipping Sulphur in Texas

THE ECONOMIC IMPORTANCE OF MINERALS

entitled "The National Importance of Mining." The following are excerpts:

* * * A proper consideration of it [mining] takes us back beyond the beginning of written history. * * * The principle underlying the national importance of mining is the creation of capital through the utilization of natural resources. * * * It has been estimated that the mineral production of Canada * * * to the end of 1933 * * * totaled nearly \$6,000,000,000 * * * the mineral production for the last eight years (despite the depression) is nearly half that of the 250 years ending 1925. * * * These statistics point to the fact that our mineral resources have resulted in the creation of capital to the value of nearly \$6,000,000,000, which * * * has been used in the development of this country. * * * The sum of \$5,211,831,611 has been produced in the last 30 years, or since the discovery of Cobalt, from which date our real history as a mining nation begins. * * * The annual production of manufactured goods in Canada at the time Cobalt was discovered was around \$500,000,000 * * * and in 1929 the value of manufactured products in Canada has reached \$4,029,271,340. * * * These are interesting figures. * * * They are factual evidence of the working of economic laws which are set in motion by the liquidation of natural resources, * * * we can say with certainty that mining has been partly responsible, and that the parallel growth of mining and national economic expansion is not a matter of mere coincidence. The two are bound together. * * * These facts, irrespective of detail, firmly consolidate mining as an industry of high national importance. * * * During 1932, the mining industry supported 61,470 employees to whom it paid the sum of \$71,722,049 in wages and salaries. It probably paid out \$30,000,000 for supplies, and around another \$24,000,000 in dividends. Expenditures for power and fuels totaled \$16,746,484, and it contributed several million dollars to the national exchequer in the form of taxes. * * * In Canada, mining provides a greater tonnage of freight than any other phase of our activities [37 percent in 1929, against 22 percent for agriculture and animal products, 13 percent for forest products, and the remainder manufacturing and miscellaneous]. * * * The importance of mining has never been more clearly demonstrated than during the years of economic stress through which we, in company with the rest of the world, have just passed. * * * public men in all walks of life have paid tribute to its [mining] activating influence during a period of great stress. * * * It has assisted materially in maintaining our international credit. * * * National resources fall under two headings: organic and inorganic. Many of those that are organic are inexhaustible through the natural processes of reproduction; but those that are inorganic are irreplaceable. Mineral resources fall under the latter heading, and it is an unfortunate fact that people, in the contemplation of mineral wealth, are likely to overlook the important point that it lacks the quality of permanence.

In his *Our Mineral Civilization*, one of the Century of Progress series (The Williams & Wilkins Company, 1932) T. T. Read has the following, in part:

One of the most striking characteristics of our twentieth century civilization

is the large and growing use of minerals. The utilization of mineral substances to maintain and improve the conditions of living for humankind is so old a phenomenon that archaeologists sometimes divide the periods of human development into ages of stone, bronze, and iron * * * The making of records has always been largely based on the use of minerals and the earliest ones that still remain are usually carved stone or burned clay. The invention of paper and ink changed this for a time, but the printing press and the production of ink from natural gas has made it again dependent on the use of minerals. And minerals have made vision independent of time and place, * * * by the aid of moving pictures. * * * There is not a single mineral substance of which the quantity used in the past century is less than the total of all centuries that preceded. For many of them the principal uses are to supply needs that have arisen within the century, and these uses enable men to do many things

that previously were quite beyond their power. So man, by his mastery of minerals, has increased his own stature. * * * The effect of minerals on man's abilities has been even more striking than its intensification of his senses. His ability to transport himself and his goods from place to place has been greatly improved. * * * Messages can be sent at a greatly increased velocity, * * * The role of minerals in this [discussed] social process is a dual one; they offer possibilities for creative work and provide the means of realizing them. * * *

Technical Management

As may be realized, the many units in the mineral industry are managed by trained and experienced men. Most of them graduated from the many colleges and schools of mines throughout the country and most belong to one or more of the national engineer societies and other organizations which are more or less concerned with mining, metallurgy, and manufacturing. These are:

American Chemical Society.

American Institute of Civil Engineers.

American Institute of Electrical Engineers.

American Institute of Mining and Metallurgical Engineers.

American Iron and Steel Institute.

American Mining Congress, The.

American Society of Mechanical Engineers.

American Zinc Institute.

Copper and Brass Research Association.

Lead Producers' Association.

National Coal Association.

Society of Automotive Engineers.

Most of these organizations have branches or sections in various parts of the country and carry on their objectives in the field.

The foregoing organizations are more or less concerned with the scientific and engineering approach to conservation of minerals and, in its report of 1934, the Planning Committee for Mineral Policy implied the necessity for scientific research and better engineering practice. The special studies needed are:

1. Extension of aerial surveys (topographic and geologic mapping) and of specific studies on occurrences and mineral-bearing districts.

2. The preparation of much more thorough inventories of mineral reserves than are now available.

3. Fundamental research in geology to improve methods of finding new mineral supplies.

4. Improvements in the technique of exploration.

5. Studies of changes resulting from improvement in transportation.

The exhaustibility of minerals warrants special emphasis on scientific and technological investigations by the Federal Government.

References

The reader who feels like studying further details of the mineral industry is referred to the following authoritative annual publications:



A Tin Prospect in South Dakota

THE ECONOMIC IMPORTANCE OF MINERALS

1. *Annual Report* of the Director of the Mint, Treasury Department, Washington, D. C. (free.)

2. *Annual Statistical Report* of the American Iron and Steel Institute, New York.

3. *Metal Statistics*, American Metal Market, New York. (\$2.)

4. *Mineral Industry*, McGraw - Hill Book Company, New York. (\$12.)

5. *Minerals Yearbook*, United States Bureau of Mines, Washington, D. C. (\$1.75, procurable only through the Superintendent of Documents, United States Government Printing Office, Washington, D. C.)

6. *Statistical Abstract of the United States*, Bureau of Foreign and Domestic Commerce, Washington, D. C. (\$1.50, obtainable as is No. 5.)

7. *World Almanac*, New York World Telegram, New York, obtainable at newsstands and bookstores for 60 cents.)

8. *Yearbook of the American Bureau of Metal Statistics*, New York. (\$2.)

9. The Fifteenth Census of the United States entitled, *Mines and Quarries*: 1929, which is a 413-page general report and reports for States and industries, issued by the Bureau of the Census, Department of Commerce, is replete with many details, some of which have been incorporated in this review of the mineral industry.

One or more of these publications are to be seen in any library having general or technical reference works.

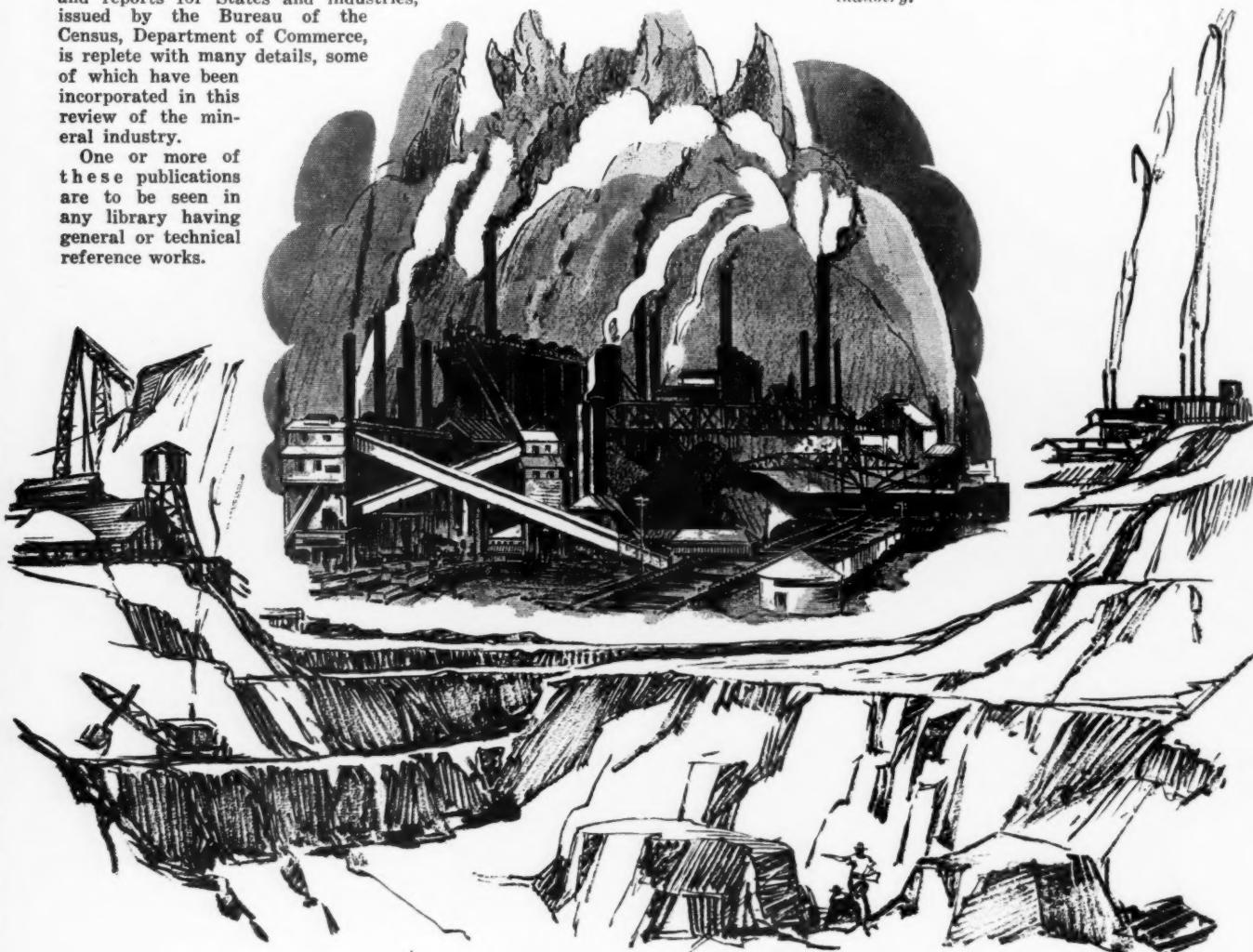
Acknowledgments

Throughout this review of the mineral industry credit has been given for contributions from which items have been taken for the several chapters or sections, also for printed reports from which figures and quoted matter were

abstracted. A list of annual references is also given. In addition, special mention is due the United States Bureau of Mines for the use of some of its photographs, and to those who answered our questionnaire.

Special acknowledgment is due to The Arizona Chapter, The American Mining Congress; The Utah Chapter, The American Mining Congress; The Tri-State Zinc & Lead Ore Producers Association; The Lake Superior Iron Ore Association; The Anthracite Institute; the Zinc Institute; Lead Industries, and to various individual companies in each branch of the Industry who have cooperated by furnishing statistics and data.

EDITOR'S NOTE:—This entire Section has been sponsored by The National Committee for the Rehabilitation of the United States Bureau of Mines, serving under the auspices of The American Mining Congress, and the direction of Mr. Eugene McAuliffe, national chairman and a committee fully representative of the Industry. The major purpose of this committee is to bring about a better understanding and appreciation of the economic importance of the mineral industry.



Wheels of Government



THE FEET of industry have been pounding the pavement in Washington during the month. But with all the pounding, no real progress has been made. The wheels have merely spun round and round, without getting anywhere in particular.

The teeming Congressional hopper is still teeming. And little headway has been made in clearing the legislative jam; (indeed, the situation has become more clogged, instead of clarified.) Congressional committees are all but sunk with bills, and hearings upon bills, and more bills. Notably, the Senate Interstate Commerce Committee. This august body has before it some of the most momentous legislation proposed in many sessions of Congress. Among them come the Eastman coordination of transportation bill, the power control bill, and the coal control bill. Hearings begin early and end late. Night sessions are in order. Chairmen refuse to listen to written statements. The proponent or the opponent is asked to file written remarks with the committee.

Tons of mail deluge Congress daily. Those for and against measures are bombarding their legislative representatives. The drive, since the convening of Congress, has been fast and furious. Haste has marked every step. The Administration has made known its wishes and Congress has attempted to oblige. But the race has been too swift. After all, Congressmen are just human beings. So like a balky horse they have stopped in their tracks and defied further pushing. This in spite of the fact that their stopping may lead to destruction of the Administration's program.

Measures in which mining is more than ordinarily interested include (1) the Social Security Measure; (2) the bills to provide for the 30-hour week without reduction in daily or weekly pay; (3) the Coal Control bills; (4) the \$4,800,000,000 Work Relief Measure; and (5) the National Labor Disputes bill.

Some progress has been made on each. The 30-hour bill has been discussed pro and con, not only in this session but in the last session of Congress. There seems to be a fair understanding of what labor wants and what the granting of their desires will do to industry. Never-

theless, it is anticipated that the bill will be favorably reported in the Senate. What the House will do about it is another question.

The Social Security bill has been dissected thoroughly. It is possible that the measure as such will not be enacted but that separate bills may be introduced providing for Old-Age Pensions and Unemployment Insurance.

The coal industry has attended the hearings on the Coal Control (Guffey) bill, en masse. From the four corners and centers of the coal fields operators have descended upon Washington. They view this proposal from many different angles, and many have been the arguments for and against Mr. Guffey's proposals. The indications are that it will be favorably reported by the sub-committee to the whole committee and that the committee will report the bill to the Senate. Meantime, wage scales await consideration... and they in turn await the outcome of such important legislative proposals as the 30-hour bill and the Guffey bill. An interesting but a vicious circle.

The President's Message advocated the extension of the National Industrial Recovery Act for two additional years. Mr. Roosevelt admits that the present law needs amendment, notwithstanding its performance of which the Administration seems vastly proud. He does not, however, indicate except indirectly how the Administration feels about the amendments. They apparently involve the anti-trust provisions, section 7a and compliance. It is wholly up to Congress to cut, fit and tailor a new dress for "Miss NIRA."

The favorable decision in the gold clause case has lifted quite a load from Administration and Congressional shoulders. Relief is evident and is already reflected in an improved feeling on Congressional Hill.

The Administration's entire program for legislative reform is understood now to be before Congress. It is obvious that if Congress is to consider all the meas-

ures presented to it, it will be in session until mid-summer. Leaders in Congress have made it plain that they will not tolerate further pushing, and that they do not propose to permit legislation to be rushed through. This means that legislation will have more serious and deliberate consideration and that bills will be debated, amended and re-amended before they become law.

The new Labor Disputes bill, known as the "National Labor Relations Act," has been introduced by Senator Wagner, of New York. This bill follows out largely the principles first enunciated in the Labor Disputes bill of last year. It provides that employees, if they desire, shall be free to organize for their mutual protection or benefits, as embodied in section 7a of the NIRA. The same principle is embodied in the Norris-LaGuardia Act and in amendments to the Railway Labor Act of last year. It prohibits any so-called company union which is shown to be supported or dominated by the employer but does not prevent employers from maintaining free and direct relations with their employees. It does not prohibit company unions in individual plants or by single employers, nor does it force closed shop agreements, but does provide that employer and employee may make voluntarily closed shop agreements in any state where they are now legal. It does provide for majority representation, i.e., that representatives selected by a majority of the employees in an appropriate unit of industry shall represent all the employees in that unit for the purpose of collective bargaining. It establishes a permanent National Labor Relations Board with a membership of three, given greatly enlarged powers to enforce decisions made by them with appeal to the Federal courts as the alternative. The new powers are modeled after those given the Federal Trade Commission and any other similar governmental agencies in enforcing their edicts, with recourse to the Courts as the alternative. Its author declares its main purpose is to give the Board authority over other boards dealing with cases under section 7a or similar provisions carried in his bill, and to clarify the confusion that has arisen in the application of 7a. The measure has the support of labor or-

ganizations and gives indication of being a bitter bone of contention later in the session. Hearings on the bill probably will be held before the Senate Education and Labor Committee of which Senator David Walsh, of Mass., is chairman. A companion bill—H. R. 6187—has been introduced, and hearings will begin March 12, before the House Labor Committee.

It is increasingly clear that the need for additional tax-revenue will result in a further study of this question. It seems fairly certain that additional revenue-seeking will be necessary to care for measures that have every indication of passage, including some kind of a bonus measure and the economic security measure. While the Administration has continuously insisted that no additional tax would be sought, the picture is changing daily, and it seems entirely possible that the Revenue bill will be opened up for amendment to provide additional revenue.

Of particular interest is the bill introduced by Senator Wheeler, whose avowed purpose is to tax "big" business, and which is an outgrowth of the present Congressional view toward corporation "control, profits and alleged iniquities." The bill exempts public utilities such as railroads, telephone and telegraph companies, insurance and banking companies, and provides for an excise tax on the "net capital return" graduated upwards from 2 percent above the \$3,000,000 mark and reaching 25 percent on returns above \$50,000,000. The Senator in introducing the bill pointed out that there are some 200 companies in the \$100,000,000 capitalization class, each of which would pay a tax of some \$600,000 based on a 10 percent return on investment. These figures, like "Andy's" of radio fame, add ciphers with bewildering rapidity, and may easily turn the head of more folks than Congressmen.

A bill of more than ordinary interest to the mining industry is the Holding Company bill, which provides for the gradual elimination of super holding company groups by January 1, 1939, will be the object of an amendment which would provide for increased taxation, not only for holding companies, but for profits derived by one corporation from another, it is reported. The amendment has already been drafted and will probably be sponsored by Senator Wheeler and Representative Rayburn, respective sponsors of the holding company measure. The amendment is aimed at "bigness" in corporate structures and although it is not planned to make the taxation excessive, there is a definite trend in important Administration circles which is apparently aimed at growth of large corporate entities.

Not to be neglected also is the bill (S. 944) to amend the Federal Trade Commission Act and to put "claws into federal trade supervision." This bill would constitute the Commission as a National Paul Fry, and would extend the authority of the Commission to include all commerce—not interstate commerce as now provided.



Senator Pat Harrison,
Chairman, Senate Committee
on Finance

The following bills of special interest to mining have been introduced since our February issue:

SENATE BILLS

S. 1629 to S. 1636, inclusive—Transportation Acts—Wheeler, (Dem., Montana). Committee on Interstate Commerce. This group of bills accompanied the report of Coordinator of Transportation Joseph B. Eastman when presented to the Senate and sent to the Committee on Interstate Commerce. They cover:

S. 1629—Motor carriers (H. R. 5262)
S. 1630—Dismissal Compensation (H. R. 5378)
S. 1631—O. S. & D. Measures
S. 1632—Water Carriers (H. R. 5379)
S. 1633—Unreasonable Preference to persons, ports, etc.

S. 1634—Reorganization of Railroads under Bankruptcy Act

S. 1635—Reorganization of I.C.C.
S. 1636—I.C.C. to prescribe rates, fares or charges (H. R. 5365)

S. 1643—Repealing Publicity of Income Tax Returns—Copeland (Dem., New York). Committee on Finance. Subsection (a) of Section 55, Revenue Act of 1934 amended by striking out all after "Revenue Act of 1926," which reads—"And all returns made under this Act shall constitute public records and shall be open to public examination and inspection to such extent as shall be authorized in rules and regulations promulgated by the President." Section (b) also stricken out. This section now requires every person making an income return to file therewith a statement containing (1) name and address; (2) total gross income; (3) total deductions; (4) net income; (5) total credits against net income for purposes of normal tax; (6) tax payable. Also repeals a similar subsection ((h) of Section 218), National Industrial Recovery Act.

S. 1725—Public Utility Act of 1935—Wheeler, (Dem., Montana). Committee on Interstate Commerce. Same as H. R. 5423. Attention of mining companies is

directed particularly to the following definitions contained in the bill:

Section 3(a) "(3) 'electric-utility company' means any company which owns or operates facilities for the generation, transmission, or distribution of electric energy and which transmits, sells, distributes, or furnishes electric energy for a charge; but does not mean a company which sells or distributes electric energy solely for the use of its tenants and not for resale."

Section 3(a) "(7) 'holding company' means (A) any company which, either alone or in conjunction and pursuant to an arrangement or understanding with one or more other persons, directly or indirectly, controls a public-utility company, whether such control is exercised through one or more intermediary persons or by any means or device whatsoever; (B) any intermediary company through which such control is exercised; and (C) any person or persons which the Commission determines, after notice and opportunity for hearing, to exercise such a material influence over the management or policies of any public-utility or holding company as to make it necessary or appropriate in the public interest or for the protection of investors or consumers that such person or persons should be deemed a holding company or companies for the purposes of this Act."

These definitions give the bill a range which would affect many mining companies which either generate power for sale or purchase power for resale.

S. 1772—Amending Leasing Act of 1920—O'Mahoney, (Dem., Wyoming). Committee on Public Lands and Surveys. Same as H. R. 5530. Changes conditions required for prospecting permits for oil and gas on the public domain. No change as regards other minerals.

S. 1853—Maximum of 3 percent for Depreciation—Bulkley, (Dem., Ohio). Committee on Finance. Amends Revenue Act of 1934 by adding at the end of Section 23 (1) the following:—"The aggregate allowance under this subsection in the case of all property subject to wear and tear shall in no case exceed 3 percentum of the adjusted basis of such property as of the beginning of the taxable year, plus the cost of property subject to wear and tear acquired during the taxable year and the cost of additions and betterments made during the taxable year to property subject to wear and tear." And also by adding after the words "but not less than the amount allowable" in Section 113 (b) (1) (B) the following:—"Computed without reference to the last sentence of section 23 (1)."

S. 1922—Coal Industry Control—Hayden, (Dem., Arizona). Committee on Interstate Commerce. Same as H. R. 5856, Lewis (Dem., Maryland).

S. 1941—Excise Tax on Net Capital Return—Wheeler, (Dem., Montana). Ordered to lie on the table. Levies excise taxes upon "net capital return" of corporations (eliminating payments for interest and dividends received as deductions) tax rate 2 percent for net cap-

ital returns from \$3,000,000 to \$3,500,000, ranging up to 25 percent of net capital returns in excess of \$50,000,000. Does not repeal present taxes under the Revenue Act. Federal Trade Commission to study and report on relation between total resources of corporation and their efficiency, with view to determining desirable maximum size of corporations in different classes of business.

S. 1958—*National Labor Relations Act*—Wagner (Dem., New York). Practically same as “Labor Disputes Act” of last session, for which joint resolution creating National Labor Relations Board was then substituted.

S. 2027—*Federal Petroleum Act—1935*—Thomas (Dem., Oklahoma.) Committee on Mines and Mining. Creates Federal Petroleum Board of 5 members with Secretary of Interior member and chairman, 4 members appointed by the President, 3 of them from nominations by trade associations within the industry. Board given power to limit imports of petroleum and its products, including natural asphalt, by placement of quotas. Also to apportion quotas as between states and within states and may require certificates of clearance for crude petroleum in such areas and at such times as may be deemed necessary. Any person adversely affected may seek court review in an appropriate district court of the United States. Act shall not be construed to repeal such portions of the Code of Fair Competition adopted pursuant to the NIRA as are not necessarily inconsistent.

S. 2039—*Transportation of Persons in Labor Controversies*—Byrnes (Dem., South Carolina). Committee on the Judiciary. Provides \$5,000 fine and two years’ imprisonment as punishment for transporting in interstate and foreign commerce persons who are to be employed “to obstruct or interfere with” the procedure of picketing during labor controversies affecting wages, hours, or conditions of labor or the right of organization for the purpose of collective bargaining.

HOUSE BILLS

H. R. 5277—*Establishing a Bimetallic Unit of Value*—Quinn (Dem., Pennsylvania). Committee on Coinage, Weights and Measures. Amends the Act of March 14, 1900 (U.S.C., title 31, sec. 314) to read:

“That the dollar hereby is defined as the equivalent in value of the combined value of seven and twenty-six forty-seconds grains of gold nine-tenths fine and two hundred six and four-tenths grains of silver nine-tenths fine, and this combined value shall be the standard unit of value, and all forms of money issued or coined by the United States shall be maintained at the parity of value with this standard, and it shall be the duty of the President and the Secretary of the Treasury to maintain such parity.”

H. R. 5424—*Reciprocal Tariff*—Andrews (Rep., New York). Committee on Ways and Means. Amends Section 350—Tariff Act 1930 by adding “(d)

No foreign trade agreement entered into under this section shall be effective unless such agreement is concluded by and with the advice and consent of the Senate as in the case of treaties.”

H. R. 5423—*Public Utility Act of 1935*—Rayburn (Dem., Texas). Committee on Interstate and Foreign Commerce. “To provide for control in the public interest of public-utility holding companies using the mails and the facilities of interstate commerce, to regulate the transmission and sale of electric energy and natural gas in interstate and foreign commerce.”

H. R. 5530—*Amending Leasing Act of 1920*—Greever (Dem., Wyoming). Committee on Public Lands. Changes conditions required for prospecting permits for oil and gas on the public domain. No change as regards other minerals.

H. R. 5536—*Repealing Publicity of Income Tax Returns*—Bacon (Rep., New York). Committee on Ways and Means. Same objective as S. 1643 and H. R. 5571, but not so complete.

H. R. 5549—*Workers Health Insurance*—Dunn (Dem., Pennsylvania). Committee on Ways and Means. Authorizes and directs Secretary of Labor to establish system of health insurance extending to dependents of insured and providing medical and nursing care including hospitalization and all special services for all workers. Sets up health insurance commissions administered by elected representatives of workers, farmers and medical profession organizations. No details on insurance set-up. “Moneys necessary” appropriated out of Treasury funds and further taxation levied on inheritances, gifts, personal and corporation incomes of \$5,000 per year and over.

H. R. 5571—*Repealing Publicity of Income Tax Returns*—Bell (Dem., Missouri). Committee on Ways and Means. Same as S. 1643.

H. J. Res. 165—*To Lower The Tariff*—Dixey (Dem., Mississippi). Committee on Ways and Means. Arbitrarily lowers specific and ad valorem duties under the Tariff Act of 1930 by 20 per cent. Also applies to duties set by the flexible tariff, trade agreements and Section 3 (e) of the NIRA. No reference to excise taxes.

H. R. 5708—*Government To Mine Gold and Rare Minerals*—Same as S. 1476—Dimond (Dem., Alaska). Committee on Mines and Mining.

H. R. 5876—*Coal Industry Control*—Lewis (Dem., Maryland). Committee on Ways and Means. Same as S. 1922. Declares coal mining affected with national public interest essentially interstate in character; requiring unified system of regulation by Congress in order to maintain normal flow of coal in interstate commerce; prevents wasteful depletion of coal deposits and the growth of monopoly; provides for the national defense and for just and rational relations between the public, owners and operators and mine workers. Does not refer to coal as a public utility.

H. R. 5928—*Government To Mine Gold and Rare Minerals*—McSwain (Dem., South Carolina). Committee on Mines and Mining. Duplicate of H. R. 5708 (Dimond, Alaska) and S. 1476, (Pope, Idaho).

H. R. 6026—*Taxing Large Land Holdings*—Moritz (Dem., Pennsylvania). Committee on Ways and Means. All lands owned in excess of a value of \$3,000 whether in possession or leased to others are made subject to “an excise charge upon the privilege of the use and enjoyment of such excess at the rate of 1 percent per annum. The term *land* shall mean and include the surface of the ground with all easements in, on, and over the same, whether covered by water or not, and including water power and rights, docks, natural deposits of minerals of all kinds, waters, oils, gases, peats, and other substances, and including advantages of access to markets, and including any rights-of-way terminals, and franchise permits, and/or grants for the purpose of acquiring, constructing, maintaining, or operating any railroad, public utility, or water power, and/or for the purpose and the conservation and regulation of the height and flow of water in public reservoirs.”

H. R. 6098—*Building Roads To Mineral Claims*—White (Dem., Idaho). Committee on the Public Lands. Appropriates \$1,500,000 for fiscal year 1936 and same for fiscal year 1937, for construction of roads in national forests when examination of mineral claims by qualified representative of U. S. Geological Survey proves existence of mineral value sufficient to warrant.

H. R. 6150—*Publicity of Income Statements*—Gray (Dem., Pennsylvania). Committee on Ways and Means. Amends the last sentence of section 55 (b), Revenue Act of 1934 to read: “Such statements or copies thereof, if the amount of the net income shown thereon is in excess of \$3,500 shall as soon as practicable be made available to public examination and inspection in such manner as the Commissioner, with the approval of the Secretary, may determine, in the office of the collector with which they are filed, for a period of not less than three years from the date they are required to be filed.”

H. R. 6187—*National Labor Relations Act*—Kennedy (Dem., New York). Committee on Labor. Same as S. 1958, Wagner, Dem., New York.

H. R. 6188—*R. F. C. Loans for Potassium Production*—Stack (Dem., Pennsylvania). Committee on Banking and Currency. Amends Section 14, Act of June 19, 1934 (relating to loans to industry), by adding at the end thereof: “The Reconstruction Finance Corporation is authorized and empowered to make loans under this section to recognized and established corporations, individuals, and partnerships engaged in the business of developing or recovering potassium salts and other minerals occurring in connection therewith.”

BIT SHARPENING ECONOMIES

By FOSTER L. APPLE*

IN TIMES of prosperity and large production, many small operating units around the mines are largely permitted to shift for themselves as far as management and supervision is concerned. They are given little attention as long as they do not interfere with or hinder production. But during times of depression, when the output is lowered, when large construction jobs are usually dormant and changes are at a minimum, management turns to these smaller, more detailed units of its organization, seeking methods of reducing its operating expenses.

A considerable savings can often be made in machine bit and coal drill sharpening costs by concentrating this work at one place where several mines are operated by one company within a reasonable trucking distance of each other. Here's the plan followed by one company.

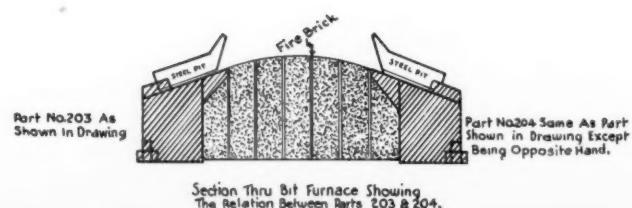
Fordson Coal Company, operating in the Freeburn or Pond Creek seam of coal at Stone, Pike County, Ky., had four mines in operation, producing 7,500 tons daily. One mine was located at Hardy, six miles north of Stone; one at Peg, three miles south of Stone; one at McVeigh, six miles south of Stone and one mine is located at Stone. All the mines are on a good, tar bound road.

At each of these mines a small shop was maintained where the mining machine bits and coal drills used at that mine were sharpened. Each shop was equipped with an anvil, a Sullivan bit sharpener and a home-made bit furnace for sharpening machine bits and a forge and anvil for conditioning coal drills.

Two men were employed at each mine for sharpening bits and coal drills and spent practically all of their time at that work. This required 8 man days or 64 man hours for 7,500 tons production, or 117½ tons per man hour for bit and drill sharpening.

Then a central supply house and repair shop was placed at Stone. Here all the armature winding, welding, frog making and heavy repair work for the entire operation was done. Supply trucks, under the guidance of a transportation manager, carried supplies from the supply house and shop to the mines each day and returned with broken parts, armatures and salvage material to the shop.

A study of our bit and drill sharpening problem indicated that a more uniform product could be secured and a



Mechanical Bit Sharpener

savings made in labor and equipment by concentrating this work in our central shop at Stone. Accordingly, a double row bit heater, oil or gas fired, known as the No. 22 Miller Automatic Bit Heater, manufactured by the Mines Equipment Company, St. Louis, Mo., was purchased and installed. This bit heater will furnish bits, properly heated, for two bit sharpening machines.

Two Sullivan bit sharpeners were installed, one on each side of the bit heater. An anvil was placed near each bit machine so any bent bits can be straightened. The quenching tank was built beneath the bit heater.

Our operation at present, with three mines running and about 6,000 tons daily production, is as follows:

On their first trip each morning, the supply trucks pick up the dull bits and drills from the previous night's operation at each mine. These are delivered to the central shop in time to start the bit sharpeners by eight o'clock.

Bits are handled in steel bit boxes which hold about one hundred bits each. Each bit box has its mine number stamped on it. The bits are dumped out on a steel topped table (shown in the No. 1 Photograph) in front of the bit heater, counted and the number of bits received marked on each box. The bits

are then placed in the bit heater by the coal drill blacksmith's helper.

The bits are worked through the bit heater by the operator of the bit machine, who presses a treadle whenever he is ready for a hot bit. As the bits are slowly pushed through the bit heater, the pick ends are gradually brought to a forging heat. As needed, they drop into a trough at the opposite end of the heater where they are in a correct position to be picked up with tongs and placed in the sharpener.

After sharpening, any bent bits are straightened on the anvil with a hammer. The bits are then placed in a trough where they slide by gravity into trays in the quenching solution. When filled, the trays are lifted, the bits dumped on the table, counted and replaced in the bit boxes.

On the last trip to the mines each day, the supply trucks pick up the boxes of sharpened bits and deliver them to their respective mines.

Two men sharpen about 2,600 machine bits in four hours. A blacksmith's helper spends about two hours counting bits and feeding the heater. About three hours are required per day to gather and deliver the bits from the mines to the shop and return.

(Concluded on page 81)

* Chief Engineer, Fordson Coal Co.

HOIST INSTALLATION

at U. S. Potash Company's Mine

By C. A. PIERCE*

In 1932 the U. S. Potash Co. installed a new hoist at their No. 1 shaft. It was selected as the most suitable installation for the property, considering the characteristics of the transmission line and of the steam turbine, both of which were installed at the same time as the hoist.

The hoist is a double cylindrical drum Nordberg hoist, driven by a slip ring induction motor rated at 350 hp. The motor is directly connected to the hoist through a flexible coupling and gears. Due to the fact that maximum summer temperatures in southern New Mexico may be quite high, the motor is guaranteed to have a maximum temperature rise of not over 40 deg. centigrade under full load conditions. This, in reality, means that the motor is a standard 400 hp. unit. All control equipment is also designed to be suitable for the excessive ambient temperature.

The hoisting operation is balanced with a vertical lift of 1,060 ft. The hoist has a capacity of 150 tons per hour at a hoisting speed of 1,000 ft. per minute. Total rope pull is 17,120-lb. made up as follows:

Ore	9,200 lb.
Skip	7,000 lb.
Rope	2,120 lb.
18,320 lb.	

The hoisting cycle is approximately as follows:

Acceleration	15.0 seconds
Full speed hoisting ..	48.5 "
Retardation	15.0 "
Loading period	15.0 "

The horse power curve for one hoisting cycle shows that the maximum input to the hoist motor, expressed in horse power, is approximately 560 hp. at the start of acceleration. The corresponding peak horse power output is approximately 450. The root mean square heating value is 344 hp.

The hoist described above is not unusual as there are a number of hoists of similar size and design successfully operating in various parts of the country. It was, perhaps, unusual for a hoist of this size to be operated by as small a prime mover as was available at the U. S. Potash Co.'s properties. It

experienced as would be expected, and operating conditions at the mine have been improved.

Recently consideration has been given to increasing the capacity of the transmission line and transformer banks to the mine, and at the same time maintaining or improving mine voltage variation. The results of these investigations show that the most economical and satisfactory method would be to install at the mine a synchronous condenser equipped with automatic voltage regulation. The purpose of the synchronous condenser, of course, would be to supply leading current equivalent to the lagging current taken by the hoist motor and other mine load and thus maintain approximately unity power factor on the transformer banks and transmission line. The reduction in power factor will give greater capacity.

For the proposed increased mine load it was found there would be a voltage variation of between 17 and 18 percent from peak load to minimum load, mostly due to variation in hoist operation. This, of course, is entirely too large for satisfactory operation. With the installation of the synchronous condenser, this voltage variation would be eliminated.

Power losses in the synchronous condenser would be quite small, amounting to approximately 50 kw. The transmission system capacity would be increased nearly 50 percent. The cost of the synchronous condenser installation would be no more than the cost of a direct current drive.

Consideration was also given to the installation of an induction driven flywheel set, but investigation has shown other installations installed for the same purpose have not proven particularly satisfactory, although they did accomplish the desired results.

AT THE request of the Chairman of the House Committee on Mines and Mining, the U. S. Bureau of Mines has prepared a table giving "Production of Coal Other Than Pennsylvania Anthracite for the Years 1919 to 1933, Arranged as Closely as Possible According to the Schedule of Districts Described in the Annex to House Bill H. R. 4661, 74th Congress, 1st Session." Copies available upon request.

* General superintendent.

SNUBBING

By D. D. WILCOX*

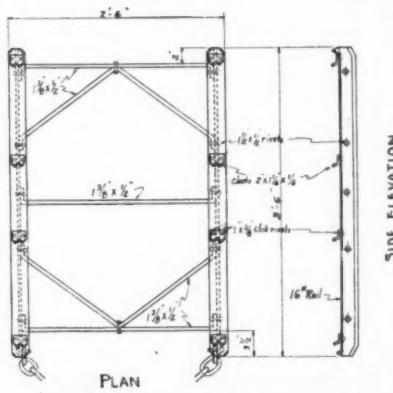
IN THE Glossary of Mining terms snubbing is defined, "To enlarge an undercut at its outby edge from an even kerf to a slope. The snubbing may be done with a pick, explosives, a small undercutting chain over the true undercutter, a pneumatic puncher, or a chain machine set at the required angle." The word does not appear in the glossaries of twenty years ago, and it is evident that the work and the word as used are both of comparatively recent origin. The newness of the term is no indication of its importance as no part of proper face preparation plays a larger role in the production of good coal. Snubbing, like other phases of face preparation, has become the responsibility of the management; in fact each improvement has added to that responsibility. In order that one may place each development in its proper place it would be well to review some of the events in our quick moving advancement.

No doubt it will be admitted that the best coal is produced in well managed long wall mines and although the possibilities of that method of mining are very limited, yet there is in those mines a pride of workmanship that does not exist anywhere else. Their mining is done by snubbing and explosives are seldom, if ever, used, but the large share of their production is lump coal. Their method was to do the mining either over or under the face, taking advantage of the conditions and then allowing the surface pressure to break the coal down or up as the case may be. This was the beginning of snubbing, but by another name. With the knowledge of explosives and the limitation of coal fields for profitable long wall work solid shooting came into being with its many complications and dangers. Under this system with the best of skill and a minimum of explosives there was a loss of from five to fifteen percent in lump coal as compared to long wall work. The miner, however, was being paid not only for the amount of work accomplished but also for the skill employed. At times shearing cuts with hand picks were put in and his drill holes were placed in such a way that they wedged the coal from the face. The miner knew his powder almost to the grain and he was familiar with "growlers," "sumpers," "lifters," and "busters." His pick was a true workman's tool. But he learned explosives

ives too well, and this knowledge became another responsibility for the management when the rate of pay was changed from screened coal to mine run. Also the pride in producing a good product was somewhat deadened as the incentive had been removed. The introduction of the puncher machine prevented the development of solid shooting to its logical conclusion, and brought, by machinery, the product a long way back to its excellence of long wall days. It also eliminated many evils that do not come into this article. While we did not

giving the miner a larger day's wage, yet the kerf of the chain machine was narrow, and if the place was not properly snubbed after cutting, either poor coal or standing coal resulted. Thus snubbing became particularly identified with chain machine mining, and the quality of the product was now definitely upon the shoulders of the foreman as the interest of the miner was solely on quantity. The investigations by the foreman proved that there was a connection between proper face preparation and injuries to those in his charge. Stuck shots and standing shots that had to be mined were the cause of many accidents and proper snubbing avoided these faults in addition to producing a better product. The foreman demonstrated to himself that he could prevent injuries and every part of face preparation was scrutinized, and the black powder then in use was changed to a permissible type. The experience of years had to be discarded and the amount of explosives to use under each condition was a new lesson for the foreman to learn.

In mines that are mechanized the face preparation is more than ever the problem of the management. Coal must be loose for machines to load it: both to keep the coal coming at the proper time and again when the machine is required to dig the coal, the cost of maintenance mounts. The mechanization has taken away from the miner the last vestige of responsibility for the product. The place is no longer his and his duty is to operate the machine or prepare the face as instructed by the officials. Face preparation had been the miners' work and his pride, and it soon became evident that it was difficult to get a job well done that had heretofore been looked upon as a simple part of the operation that somehow had gotten done without any attention. Since the first change in mining methods, from long wall to solid work and then down to our mechanical loading, has been but a few short years. In contemplation of the accomplishment in the short space of time it must be admitted that the results have been revolutionary. The improvements have been in almost every phase of coal mining; not only mechanical but in personal relations and personal responsibilities. While the responsibility of the miner to his employer to produce the best possible product has lessened, the employer has accepted his responsibility for accidents to the employee, and



Snubbing Drag Used by Indiana and Illinois Coal Corp.

speak of it as snubbing, the puncher machine mined and snubbed the coal in practically the same way as the long wall miner mined his coal, only deeper. Of course explosives were used instead of relying on roof pressure. The miner became accustomed to having his mining done by machinery and the use of the pick started on its way toward being a lost art.

With the establishment of chain machines came the necessity for snubbing as an independent piece of work. This work was not welcomed by the miner and was never done with alacrity. The miner had reluctantly accepted the puncher machine, but had come to look upon it with considerable favor as it had not only lightened his work, but had been the means of securing him better wages. The chain machine, while cutting for many more miners than the puncher and thus

* General Superintendent, Superior Coal Company.

for the face preparation. The mine tipples with their modern sizing and screening equipment, the many trucks for loading different sizes of coal and the up-to-date power plants and engine rooms are the most apparent of the improvements; as well as larger shafts, heavier cages or skips, improved methods and machines for caging, heavier track, and haulage equipment, better lighting and safety equipment, improved mining machines, electric drills and advanced explosives. We have utilized all of the skill of engineers and the cooperation of manufacturers and yet our net result has been increased production and it is questionable if our product will favorably compare with the product of other days, the days when mining was in its infancy. We might be easily influenced to believe that we have sacrificed quality to get increased production.

With the coming of mechanism it appeared as though it was necessary that we make our choice between quantity and quality or rather between our best product and the production of coal at a price at which it could be sold. Oftimes, however, instead of deciding between two plans it pays to try to synchronize them. Our best product could be made to keep step with our increased production. Our improved explosives, electric drills, our concentrated mining with better supervision should be a decided aid in procuring better coal.

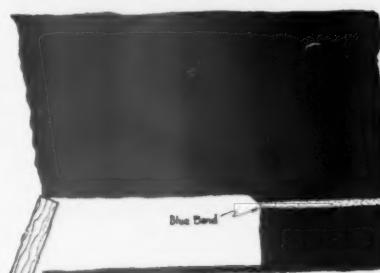
Many mining authorities believe that the value of large coal is greater in an historical sense than in any other. All of us who are producing coal agree among ourselves that there is a false importance given to the relative values of different sizes of coal, but, unfortunately perhaps, the customer has no such ideas; he wants chunks. Of course there have been many improvements in coal burning equipment which have to a slight extent overcome the desire of the public for large coal, but after all the officials of a successful property must have a constant understanding of market conditions.

The finest surface equipment can not remedy the ills of poor face preparation. The results are such that one might well wonder if we have carried our depreciation of the skill of the erstwhile miner just a step too far or discarded him a day too soon. To get the best results we must give due consideration to the skill and experience of generations of trained miners. The best of machinery cannot wholly take the place of skilled men, and even an aluminum or a silver plated drill needs an intelligent operator. We need skillful face preparation in order to give our machinery and explosives an opportunity to do their work. It is possible to get clean coal, well sized coal, cheap coal, but not the best market product unless the place is properly snubbed. The coal must have the same opportunity to fall over that the long wall miner gave it.

We might stop to consider just what we are trying to do. It is to get, with the equipment at hand and with the greatest amount of safety, the maximum amount of marketable coal from



Hand Snubbed and Loaded Out



Snubbing Shot With 3 Holes and All Loaded Out

each working place in the shortest time possible and at a minimum cost. Most of us are familiar with the operations where the cutting, drilling, loading, even the explosives are used properly, and yet the grade of coal delivered to the top of the mine is not a satisfactory grade.

It is safe to assume that all of the coal is being mined by chain machines—breasts, shortwall, mounted cutters, shearing machines or perhaps a combination of some of the above, which cut a kerf of not more than six inches or just sufficient for the chain to clear. Not only is the kerf narrow but the very nature of the machine tends to drag the cuttings back into the cut. This narrow cut is not sufficient to take care of the natural increase in the space required for shot coal unless it is overshot enough to crash it out from the face. Hence it becomes important, necessary, that this cut be enlarged or snubbed.

Most of the cutting is done at the bottom of the seam though a large tonnage is cut up in the seam or at the top. Machine manufacturers have given their assistance to proper snubbing by designing a chain machine directly over the normal cutter bar. In many cases too, shearing machines are used in addition to the undercutter and in every case they have added to the quality of the product provided the shearing cut has taken out a sufficient amount of the coal at the face to allow for the natural expansion that occurs when the coal is broken up. The manufacturers have also improved the cutter chains and have stressed the necessity for sharp bits which make larger cuttings and less "bug dust";—not only better coal but less likely to pack in under the cut.

Even if all the factors are known such as friability, the bands of impurities and the cleavage of coal, I do not know of any scientific formula that could be

used to plan the proper amount of snubbing. We have been told that bituminous coal occupies seventy-five percent more space when broken than it does when solid. Snubbing has certain simple requirements. The place should be snubbed from rib to rib of sufficient height and depth to allow the coal to turn over when it is blasted. It may be necessary to set up a different system of snubbing in different parts of the mine, but it is possible to set up a minimum requirement.

For the mine foreman to exercise his best judgment in snubbing there are many things to take into consideration, and his failure to give each his proper place may prove disastrous. Most of these items are beyond his control, such as the coal seam, its cleavages and bands of impurities; the grades, height of seam, the over burden and floor; the gases encountered and the fire hazard, the explosives and equipment at hand and the system of work.

The first work is to remove all of the "bug dust" or cuttings out of the cut, the shovel being flattened for this purpose, and at most operations the snubber is provided with a tool which resembles an overgrown stove scraper. A decision must be made whether to snub by means of sledge and wedge and pick or by explosives. The conditions of the seam will probably decide this, but in most cases the coal can be snubbed better by shooting. In districts where shooting is permitted but once each day, this plan holds up the place an additional day, and thus requires more working places to produce the output. It may be too that the type of loading equipment will have a bearing on the method of snubbing.

Explosives cannot take the place of snubbing and the amount of snubbing required has no bearing on the type of explosives used. It is true that the location and number of holes for shooting down the top coal will be different in places hand snubbed and shot, but the same amount of snubbing is required for either method whether the explosives be black powder, pellet, permissible, cardox or any other explosive element. The coal requires room to turn over if one expects to get the most marketable product and while explosives are manufactured for every purpose, that purpose was never to take the place of skill or to overcome deficiencies in some other part of the operation. The best explosives are entitled to an opportunity to do their work. Better snubbing will cut down the amount of explosives used.

It must be understood that the problem is different in each field and with almost every company, due not only to the seam and the equipment at hand, but to the requirements of the customer as well. In every mine proper snubbing is worthy of care and attention. At Mine No. 10 of the Indiana and Illinois Coal Corporation, located at Nokomis, Ill., they have in use a "snubbing drag," a sketch of which is shown. After cleaning out the bug dust in a thirty-foot place three holes are drilled about two

(Continued on page 78)

Underground Railways

in the Unseen Empire*

THE small boy who believed that if he dug a hole deep enough he would soon come to China was not so very far off after all. For men are digging into the earth and revealing, and building, an unseen empire—that of the mineral world which is the source of half of America's wealth. Suitable transportation is always Requisite No. 1 for any kind of an empire, so it is not surprising to learn that underground railways play a key role in making it possible for the earth to yield her treasures to mankind. It is one thing to discover a deposit of gold or coal or copper—and another to build a railroad to haul it out.

The romance that has grown around railroading would heighten even more if everybody could know that the pioneering days are not behind us. On the open ground, America's railroad system is now largely complete, a monument to engineering skill, financial genius and organization. But our underground railroads are being built and torn apart every day. Pioneering is the routine work of the subterranean railroad builder, and he will never be done. Every foot of the way is tunneling—and every few feet that the miner advances the railroad must follow him—quickly, safely and economically.

This is not only a difficult project, but a big one. For instance, in the State of Pennsylvania there are more miles of mine railways than there are miles of railway on the open ground. There are also many more hazards. Explosive gases or dust threaten not only the demolition of the railroad, but great loss of life. "Ceilings" are only too ready to come down and blot out the railroads—and sometimes do. Total darkness prevails at all times, yet most lighting must be done electrically because open flames might ignite the explosive gases before mentioned. This is an expensive railroad to build and to operate, yet one that must be built and operated inexpensively because it will have value only while that particular section of earth still yields treasure. If it costs more to bring that treasure out than it can be sold for mining would naturally be unprofitable.

The last few decades have seen an amazing advance in underground railroad technique. Indeed the last several years have yielded even more progress in this direction with the more wide-

spread use of locomotives powered by storage batteries. While this method may seem a "natural" today, it was developed slowly over the years through the trial-and-error method.

The mule came first. That hard-working if ill-tempered animal was pulling coal cars down in the dark regions of the earth while his half-brother was drawing passengers in the horse-car above the ground.

Obviously the steam locomotive and the gasoline engine were ruled out. Open fires were not allowed in mines and miners have enough elements to battle without adding carbon monoxide to the list. A trolley-car method of furnishing power to locomotives was tried. But the ever-present danger of roof falls make the stringing of trolley wires hazardous, since it often results in electrocution or bad-burning of miners—and proved costly besides.

There then developed two types of locomotives for "gathering" the mined ore or coal—locomotives which overcame to some extent the disadvantages of trolley wire. These are the crab-reel and the electric cable reel. The latter outlived the former due to the varying of conditions favorable to its use. This carried a section of insulated trolley wire on a reel operated by a torque motor or geared to the locomotive axle. One end of the double conductor cable was fastened to the trolley and the other end to the rail—both outside the room or chamber where the miner was at work. The torque motor operated the reel so that regardless of the direction of the locomotive, the cable was taut. This was a considerable improvement over the "trailing cable" which often caused short circuits resulting in explosions or other accidents after the insulation had worn from the cable. However, all of the hazards have not been eliminated and the risk is more serious now because of the greater concentration of work and the higher investment in plant and equipment.

Shortly after the development of the cable reel locomotive the storage battery gathering locomotive made its appearance. By reason of its inherent characteristics and advantages, it quickly developed into a practical and efficient haulage unit, and has improved steadily, resulting in the approval in 1928 as per-

missible by the United States Bureau of Mines. The modern storage battery locomotive is safe, reliable and economical and its features make it closely approach animal haulage in flexibility. It is fed (charged) and watered at night, when the load of the power plant is light.

Naturally cost is a foremost item in the operation of all underground railroads. That of storage battery locomotives and of cable reel locomotives are about the same, but when cost of operation, maintenance and repairs are considered, the storage battery locomotive makes a much better showing.

The late Thomas A. Edison contributed much to underground railroading with his invention of the nickel-iron-alkaline storage battery, which has several times the life of the lead acid storage battery. The battery which Edison invented is in wide use for mining purposes, and its simplicity and long life make it economical and dependable to operate. While not all the storage battery locomotives employ the nickel-iron-alkaline battery, it is safe to say that wherever costs are figured carefully, this is the one favored.

Economic conditions of the last four years have, however, seriously interfered with the development of safer and more economical "railroading" in mines. While it almost universally is recognized that the storage battery locomotive not only reduces dangers, there are many mines still operating with old equipment, not so safe, nor so dependable. With the return to a more promising business curve, it is almost certain that many more mine operators will install this type of equipment. It has been demonstrated that the battery-propelled locomotive actually cuts production costs and, of course, this gives added incentive to modernization of methods.

There is every reason to believe that "underground" railway will undergo as much progress as the on-the-ground railroads during the next decade. On the ground, it is likely to be interpreted in terms of stream-line trains, Diesel engines and electrification of roads. Underground, there will be extended use of battery-operated locomotives, which will help to add records to the "speed of safe production." There's romance in railroads—on top or underneath the earth. And those of the unseen empire will contribute, probably just as much wealth to the nation as the railroads we see every day.

* Submitted by Edison Storage Battery Co.

POWER ECONOMIES

By GEORGE W. RATHJENS*

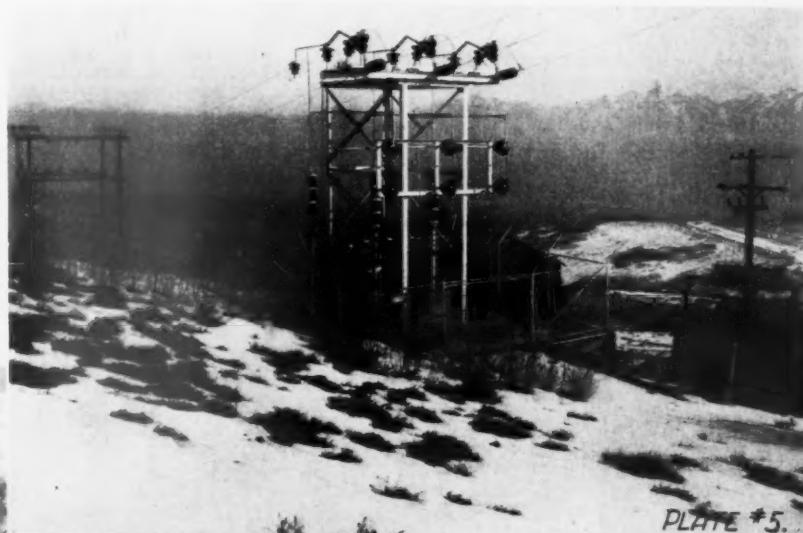
MANY SMALL metal producing properties, which in the past have been good producers, reach a period when they can no longer be commercially operated. Such properties, when consolidated with others thereby sharing in the benefits of quantity production and good management, may form parts of a commercially successful unit.

Prior to 1924 the mining properties of the United States Smelting, Refining and Mining Company in Bingham Canyon, Utah, were operated largely under their own steam power. The only electrical energy used was that needed for surface and underground lighting, shop motors and one 200 H. P. hoist. This energy was purchased from a public utility company under two schedules; one for light and the other for power.

The power consumption in December, 1923, was approximately 41,000 K.W.H. with a demand of 360 H.P.

As development progressed the demand for power increased. This was due to the introduction of storage battery haulage motors, deep shaft sinking equipment, pumps, etc. This demand was temporarily met by the installation of larger transformer capacity. The primary voltage was 5,000 volts.

In 1929 the United States Smelting, Refining and Mining Company acquired the property of the Bingham Mines Company at Lark, Utah. This property was



Above—No. 12 Raise Substation and Loop Connection to Power Company's Jordan Narrows Line
Left—Yosemite Substation and 44,000 V-Line Over Hill to Niagara Substation

adjacent to the mine they were operating in Bingham Canyon.

The Bingham Mines Company was also supplied with purchased power of 5,000 volts, delivered to substations at the portals of its Yosemite incline and No. 12 raise. This was distributed through the mine workings at reduced voltage.



Copperfield, Utah, Showing Power Company's Line from Bingham Entering the Niagara Substation

The monthly requirements of the Bingham Mines property at the time of the purchase were 85,000 K.W.H., with a demand of 400 H.P. The power was used for compressors, hoists, pump and haulage.

In the beginning of 1930, the consolidated properties were receiving power at 5,000 volts delivered at three different points, namely Old Jordan, Niagara Portal and Yosemite Incline. The total monthly power consumption had increased to 380,000 K.W.H. with a maximum demand of 1,400 H.P. The combined bills totaled \$4,800 per month.

A careful analysis was made of the power problem. The study indicated that if all electrical energy could be delivered at one point and purchased under a more favorable schedule and load factor, a considerable saving would result. Surveys and studies were completed in 1929 and 1930. After a consideration of probable future requirements, the following plan was adopted:

(1) Construction of a 44,000-volt substation at the Niagara Tunnel to serve as the distributing and metering point.

(2) Extension of the 44,000-volt line after metering to the Yosemite Shaft, a distance of 3,870 feet.

(3) Distribution from the Niagara substation at 2,300 volts to the various workings of the Old Jordan and Niagara Tunnel.

(4) Stepping down from 44,000 to 2,300 at the Yosemite substation for distribution over old lines into the Yosemite workings.

The work was completed in September, 1930, thereby placing all the mines on the new 44,000-volt metering equipment at the Niagara.

The old 5,000-volt line between the Yosemite and No. 12 Raise was continued in use to transmit power after being stepped up from 2,300 to 5,000 volts at the Yosemite.

In 1931 the need of more

Year	Average Max. H.P.	Total K.W.H.	Calculated Cost		Actual Cost New Schedule
			Old Schedule	New Schedule	
*1930	1398	1,274,559	\$16,182.66	\$12,860.12	\$3,322.53
1931	1388	5,151,786	62,256.87	48,963.47	13,293.40
1932	1642	7,223,480	82,620.99	64,701.71	17,919.28
1933	1654	7,341,129	83,752.47	65,400.34	18,352.13
1934	1709	6,592,000	78,443.25	61,603.28	16,839.97
Total			\$323,256.23	\$253,528.92	\$69,727.31

*From Sept. 19, 1930 to Dec. 31, 1930.

Average gross saving per year on power bill.....	\$16,278.88
Because of nature of service, (amortization—10 years)	
Annual charge for amortization.....	\$3,559.45
Average annual charge because of loss of interest.....	1,067.82
Total annual charge.....	\$4,627.27
Estimated yearly cost of repairs.....	300.00
Net annual saving.....	\$4,927.27
	\$11,351.61

power at No. 12 Raise, which is one of the adits through which the cables are run into the Lark Mine and Mascot Tunnel, justified the construction of a 44,000-volt line from the Yosemite, a distance of 5,560 feet, and a new substation on the

surface at the top of the raise. (See Plate No. 5.) The cost of this addition is not included in the cost given below as it has no bearing on the subject involved, but it was a noteworthy improvement as it offered a means of connecting with another 44,000-volt line of the power company which passes near No. 12 Raise; thereby providing additional insurance against interruption of service.

The transformer equipment installed at the Niagara substation (See Plate No. 2) consists of 3—500 KVA, 44,000 to 2,300-volt transformers, and at the Yosemite substation (See Plate No. 4) 3—250 KVA, 44,000 to 2,300-volt transformers.

The main transmission line is No. 2, 3-strand M.H.D. bare copper except for a 1,200-ft. span (See Plate No. 3) where 5/16-in. Siemens-Martin seven-strand, high

(Concluded on page 81)



Niagara Substation

HOISTING PROBLEMS

in Lead-Silver Mines of Utah

By LEONARD WILSON*

THE PROBLEMS presented by hoisting are varied, and depend largely on the expected and actual modes of occurrence of ore. Hoisting is merely transportation in a vertical direction, and is sandwiched in between two horizontal movements, either one of which, or both, may be quite short. In any event these three transportation movements must function together.

In the lead-silver mines of Utah there are examples of every condition from one extreme to the other. Historically the first prevailing condition was that of a main shaft sunk from the surface to a depth of about 2,000 feet, with waste dump and ore bins close to the collar. Such a shaft was suited to the opening up of a property in which ore occurred in many small bodies scattered through a mineralized zone of considerable vertical and horizontal extent. An important function of the shaft was that of developing access to all parts of the mineralized zones, and this required the driving of several hundred thousand feet of drifts and cross cuts at many different levels. The invariable practice for such condition is to tram the mine cars to the shaft, hoist them in double-deck cages to the surface, and there tram them the very short distance to the waste dump or ore bins.

For such type of hoisting the important problem has been that of minimizing the total operating cost of power and labor per shift. The power cost has been materially reduced by the adoption of more perfect electric control with strict avoidance of high rope speed; and by the gradual elimination from the general power rates of unfair surcharges for hoisting. The cost of operating labor per shift has not decreased, and in some cases it results in a marked addition to the mining cost per ton of ore. Unnecessary lost time in starting, stopping and caging is minimized by proper layout of the shaft stations, and skillful teamwork of the men.

The efforts to minimize accidents in such shafts have been very successful. Contributing to this success is the improvement in the human element brought about by wise co-operation of the companies, the State Commission and the men. Another contributing factor is

the perfection of signaling devices, including those for signaling direct from the cage. In some mines the successful operation of the cage signaling system is such that it has been adopted to the exclusion of signaling from pull switches mounted at the stations. In such cases the pull cord on the cage is located so that it can be reached by a station tender just as readily as could a pull switch mounted on the station post. The device is such that the signal relay at the engineer's platform will respond only to the direct current impulse from the battery on the cage.

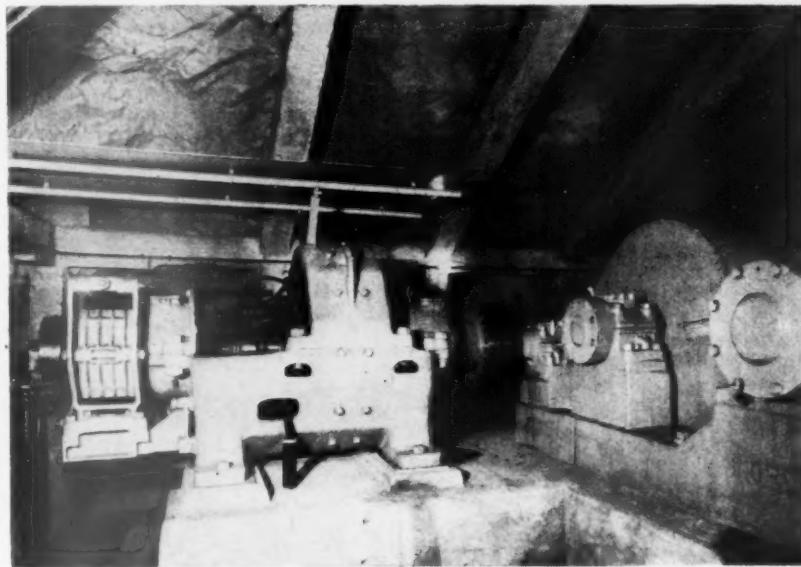
Although the labor cost of cage and car hoisting is high, the service given by it is in some cases very well worth the cost, and the adoption of the better mechanized types of hoisting, while reducing the cost of hoisting labor might increase other cost out of proportion.

The present day developments of mining are taking place in large consolidated properties. This leads to the utilization of suitable levels as main transportation tunnels with properly equipped loading stations at their portals. This in turn makes it feasible to do more of the hoist-

ing in shafts close to the ore bodies. The general tendency is towards short distance tramping to the shaft, hoisting in large capacity skips, and transportation in large tunnels cars to the loading station. This frequently results in the installation of underground hoists, and the proven ease of transmitting electric power underground to any point required accelerates this tendency.

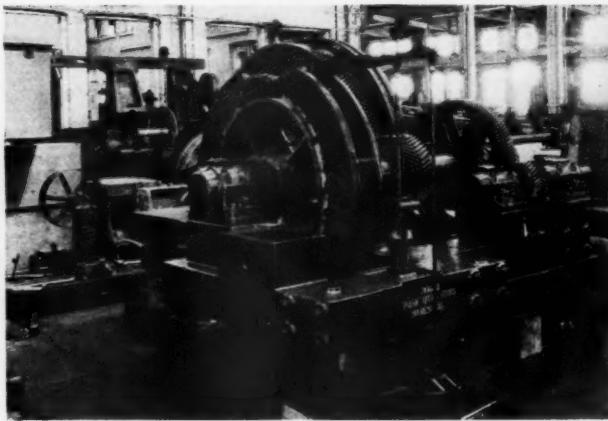
With a shaft located close to a large ore body, and hoisting direct to a main transportation tunnel, the function is primarily that of hoisting ore, and the equipment can be planned so that the operating cost per unit is very low.

A typical case is that of a sub-shaft at the Park Utah mine, which was laid out for a maximum hoisting capacity of 1,000 tons in one shift. The equipment, of which two photographs are shown, comprised a Nordberg Bollen Pulley geared to a DC motor of standard steel mill type, furnished with current from an MG set with automatic Ward-Leonard control. The hoist operated a single 12,000-pound capacity skip, counterbalanced by a heavily weighted cage. The ultimate capacity was for a hoisting

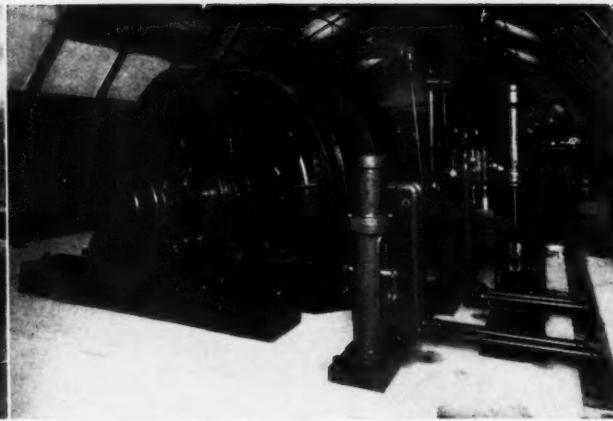


Underground Hoist at Park Utah Mine

* Consulting Engineer, Salt Lake City, Utah.



Bollen Pulley Hoist for Park Utah Mine



Underground Hoist, Bingham Mine, U. S. Smelting Co.

depth of 750 feet at a rope speed of 800 fpm, but during the initial period the depth was only 375 ft. and a rope speed limited to 360 fpm was sufficient to handle 1,000 tons of ore in one shift. The Bollen Pulley with all the auxiliary equipment was installed in a small station cut out directly above the top of the shaft, and was operated by remote control without a hoist engineer. The manual control device consisted merely of a small control switch, having two positions each side of neutral. The two extreme positions were Hoist and Lower, and the intermediate ones were "Hold." A spring return brought the handle to neutral when released. Moving the handle to Hoist and keeping it there, caused the hoist to start and increase its speed at a definite rate of acceleration, but if handle were moved back to Hold before full speed was attained, the hoist would continue to run at that reduced speed as long as handle remained at Hold. Similarly, moving the handle back to neutral would cause the hoist to slow down at a definite rate of retardation, but if handle were moved forward to Hold before the hoist had stopped, it would continue to crawl at that speed as long as handle remained at Hold. This manual control switch required a four-wire control circuit. It could be located wherever desired, or could be duplicated at a number of points (including on the cage) with a single removable to prevent any conflicting control.

With the manual control switch located at the bottom loading pocket, and operated by the man that operated the loading chute gate, there would also be installed at this point the hoist position indicator, the start and stop push button for the MG set, and the safety device indicators. The position indicator had two hands, one making less than a revolution for the trip, and the other making many revolutions per trip, so that it moved one scale division for each foot of travel. These indicators were Selsyn oper-

ated, requiring a three-wire control circuit, and could be duplicated at any other desired control points. An automatic time relay was connected to shut down the MG sets whenever the hoist remained stationary for more than a preset number of minutes, in order to minimize standby losses. A complete set of safety devices were connected to immediately shut down everything and apply the service and emergency brakes.

Such an installation permits operation at the absolute minimum of operating labor, but it also operated at remarkably low power cost. When operating at full capacity for one shift during which it hoisted 1,000 tons of ore 375 ft. in 7 hours, together with one hour for hoisting men and supplies, the total power consumption measured at 2,300 volts AC including all auxiliaries and ventilation, amounted to only 800 KWH for the 8 hours. This amounts to 0.8c per ton hoisted 375 ft., or in the more usual units, to 2.1c per 1,000 ft.-tons.

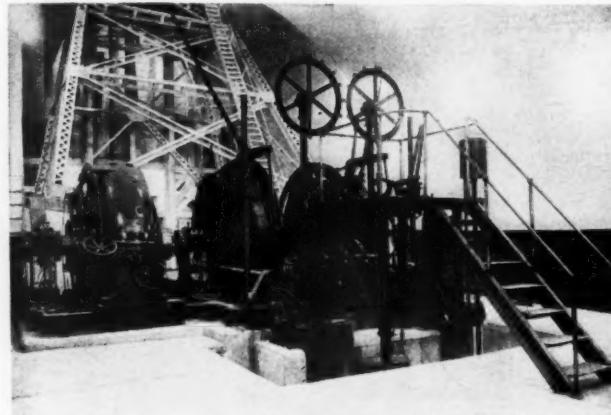
It is to be noted that such a system of remote control of a mine hoist is not feasible if clutches have to be operated, nor is it feasible if an AC motor is used. The Bollen Pulley, however, is not essential for automatic operation, and in fact is very limited in its field. Where it can be used it gives a very low cost installation because it requires the minimum cost for cutting the station.

Another example of a hoist with Ward-

Leonard control is shown in the photograph of the Silver Hill underground station of the Silver King mine. This installation was made at a time when the differences in power rates were such as to make it economical to install Ward-Leonard control. The equipment comprises a Wellman-Seaver-Morgan flat rope double reel hoist direct coupled to a gearless General Electric DC motor. Cage hoisting was required and the adoption of a flat rope hoist was advantageous in permitting installation of the hoist within the shaft station. It is of interest to note that this photograph was taken more than 20 years ago.

A fine example of a recent underground hoist is shown in the photograph of the Niagara Shaft station of the United States Smelting Company's Bingham mine. The hoist is a double drum Nordberg geared to two General Electric 500 HP induction motors. This feature of using two motors geared to a hoist is advantageous when the motors are properly selected. The maximum torque of one motor alone is just sufficient to operate the hoist, but the heating would be excessive for continuous hoisting, and the efficiency would be low. With both motors the efficiency would be a maximum, and the heating well within the safe limit. The combination eliminates the necessity for carrying a spare motor. The control of this hoist is typical of the best practice, comprising ruggedly designed magnetic contactors for primary reversing and secondary resistors, with a manual pilot controller having control points forward and reverse of neutral. Secondary contactors have sequence interlocks and current limit control. A modification of the standard control handle that is in use in some Utah mines is particularly adapted to control when motor is "plugged." The handle has the usual straight forward and reverse travel, but at the neutral position it can be moved sideways and then forward and reverse along another parallel

(Concluded on page 78)



Underground Hoist, Silver King Mine

Of all things...

There were plenty of creased brows and muttered oaths over the work relief bill impasse last month. . . . While the Administration forces kept a stiff upper lip and smiled courageously, it didn't take much analysis to determine that the smiles were thin and the courage a thin veneer. . . . Nobody denied that the New Deal was at a crisis . . . its first important crisis and far more important than, for instance, was the gold decision by the Supreme Court. . . . There were many who admitted that it looked like the Administration could kiss the remainder of its program goodby this session. . . . But the boys who were doing most of the worrying were the bright little college graduates in the downtown departments . . . there are a lot of them still around. . . . And they're still worrying, too.



Most reporters covering official Washington agree that the best news is never told, much less printed. . . . Some of it can't be told. . . . Newsmen get their chief reward in the satisfaction of knowing things. . . . There isn't much satisfaction in writing a story that brings one of three responses: "Is that SO"; "It ain't so"; or "So what." . . .

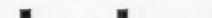
But it can be told that at least one Senator Sings. . . . Not to anybody in particular. . . . Mostly, to the stars. . . . We followed one solon, famous for his resplendent sartorial effects, out of the Senate Office Building one cold night in February. . . . In the Senate park across the street, he stopped . . . adjusted his cravat . . . brushed the snow from his pearl gray spats . . . planted his cane more firmly in the snow . . . coughed once or twice . . . and then burst out in song. . . . The park, of course, was deserted . . . except for the lone observer . . . and he hastily left.



The Agricultural Department drew in its neck a year or so ago when the newspapers of the country played up the cost of a bulletin recounting a scientific investigation into "The Love Life of Frogs." . . . The latest thing out is a searching investigation into the private life of the cockroach. . . . Nobody knows yet what it cost. . . . There's another bulletin that sagely informs one that 2,000 bacteria were found in the stomach of a flea. . . . And then one wonders what happens to the tax dollar.

It would be a good idea to know where your American Flag came from hereafter before you display it for the Fourth of July. . . . Because if a

bill introduced in the Congress recently is enacted, you could spend 60 days in the jailhouse and pay a \$1,000 fine (if you have it) for displaying a flag made outside of the United States. . . . Seems that an investigation has disclosed that 50 percent of the American flags now in use (especially the small ones) are made in Japan. . . . Wonder if we make Japanese flags? . . .



One type of legislation which doesn't have much trouble in securing congressional sanction is that calling for an investigation. . . . Congressmen just love an investigation. . . . So recently when a resolution came up calling for an appropriation of \$500,000 to investigate the oyster borer, it slipped right through. . . . The Senate without a nay vote, agreed that such an investigation might prove exciting. . . . The House heard it was another investigation and passed it too. . . .

After all, it isn't every day that the Congress gets a chance to spend a half million dollars to find out about oyster borers. . . . These are cute little marine organisms who are so fond of oysters and clams that they dig their way right through the shells and take up housekeeping with the oyster, the latter promptly dying, probably of shame. . . . Maybe that was what the investigation was to determine. . . . Anyway imagine the surprise of the Congress when the bill came back from the White House. . . . Vetoed! . . . The first veto of the 74th Congress. . . . The President said he just couldn't figure out where the half million dollars was coming from, and anyway it was pretty doubtful if it was worth that much money to learn all about the life of the oyster borer. . . .



But that didn't stop Congress. . . . A few days after hearing about the veto, another legislator bravely got up and announced he would attempt to tack an additional \$15,000 on the Agricultural Department appropriation bill. . . . to pay for a pickle investigation. . . . It isn't a pickle borer this time. . . . It seems that there's a lot of waste and inefficiency in the cucumber pickling industry down in North Carolina. . . . The Congressman thinks the Government ought to look into it and find a more efficient way of doing things. . . . And imagine, some people think the Government stands for red tape. . . .



The Six-Hour Day

and Thirty-Hour Week

THE PURPOSE of this proposed legislation is to increase employment and wages. Without any doubt everybody would be happy to contribute to that accomplishment. Could we believe that this measure would effect its purpose we would support it. The fact that the mining industry has spread employment to the greatest possible degree, even to the extent of operating properties at a loss and carrying on unneeded development work, is evidence of our sympathy with the objectives of this bill. However, we oppose the bill because we believe, and think we know, that it would not only fail to accomplish its purpose but would be an effective bar to that accomplishment by suspension of the operation of normal recuperative forces.

Briefly stated we oppose this bill:

1. Because it does not recognize the inexorable fact that wages are and can be paid only out of the product of labor. This bill would reduce the product of labor and therefore would in the end inevitably reduce real wages in terms of net purchasing power, regardless of their measure in money. We want to increase the net purchasing power of wages to the greatest practicable extent. This bill would reduce it.

2. Because legislation of this type is justifiable only on the assumption that labor is not receiving all that it earns, i. e., its full share of the goods produced—whereas it is a matter of common knowledge, evidenced by the shrinking assets of employers, that labor on the whole is receiving more than its full wage in terms of the value of the products of industry. The inability generally of mineral producers to get the price and volume of sales necessary to cover cost, of which labor on the whole, in the final analysis, constitutes more than 90 percent, is a fact which can be easily verified from governmental sources.

3. Because it will decrease employment in two ways, namely: (a) It will increase the cost of goods, and hence the price of goods; hence it will diminish the consumption of goods and therefore decrease the labor employed in the production of goods. (b) It will stimulate production only of those goods which can be produced with the least possible employment of labor; the immediate effect will be to shift production to those places and establishments having the lowest cost of production in terms of labor hours.

Although these fundamental objections to this bill have application to industry generally, it is the duty of The American Mining Congress, which represents the principal branches of the

Statement of Julian D. Conover,
Secretary
American Mining Congress
Before a Subcommittee of the Senate
Judiciary Committee Considering the
Black Bill (S.87) February 14, 1935

mineral industry of the United States, to inform you in particular of the repressive effect this measure would have on the production of minerals and the employment of labor therein.

The mining industry is in general operating under an 8-hour day and 40-hour week, except in the case of anthracite coal, in which a 48-hour week is in effect, and bituminous coal, in which a 7-hour day and 35-hour week were fixed by code on April 1, 1934.

The 8-hour day is a basic feature of underground mining. In the larger and deeper mines, employing large numbers of men, there are many miles of underground workings, and considerable time is required in getting to and from the working places. A careful check in one of the large mines of Idaho recently showed an average of only 6 hours and 36 minutes at the working places, and a similar check in mines of Utah, California, and several other states has shown only about 6 of the total 8 hours actually spent at the face.

With such a condition prevailing, reducing the shift from 8 to 6 hours would mean in reality a reduction of the working time to only 4 to 4½ hours, and would hence mean a far greater decrease in production per shift than indicated by the ratio of 8 to 6. The 6-hour shift would make it extremely difficult if not impossible to carry out the necessary cycle of operations—including preparation of the working place (with removal of the broken ore, and timbering where necessary), setting up the drill, drilling of the holes, dismantling and removing the drill, charging, and blasting—all of which must be completed in one shift in order that the powder smoke may be cleared away before the next shift goes to work. To have this cycle completed by other men, on a split-shift basis, would be impracticable and exceedingly dangerous. The necessity of blasting at the end of the shift and thereafter allowing a sufficient time for the toxic gases to be cleared from the mine, for unexploded holes to be located and reported, and other precautionary measures taken for

the safety and health of the men is universally recognized, and the United States Bureau of Mines and the various state mining bureaus have emphasized the need of such procedure.

The increased cost for direct labor under the proposed law in most industries would be 33 1-3 percent. In other words, a reduction from 8 to 6 hours per day, or 25 percent, without reduction of the daily wage, would mean an increase of 33 1-3 percent in the wage rate per hour. In underground mining operations, however, the increase in labor cost would be considerably more than this, due to the greater proportionate reduction in time spent at the working place. Thus, where the actual effective working time under a nominal 8-hour day is at present only 6 hours per day, this would be reduced to only 4 hours per day—a reduction of 33 1-3 percent in effective hours, which would mean an increase of 50 percent in the wage paid for each hour of actual work.

Labor is the largest item of cost in underground mining, representing over 50 percent of the direct cost of most operations. Hence this bill would impose an immediate and large increase in costs of production. Such an increase under present conditions, would necessitate the closing of so many operations as actually to reduce the employment of labor instead of increasing it.

The foregoing affects not only the mining industry, but the mills, smelters, reduction plants and refineries. To secure any kind of efficiency and economy, the work and the processes at these plants must be continuous. Supplies of crude ore or concentrates from the mines must be forthcoming as needed. The mines, in turn, are dependent on the smelters for the purchase and reduction of their ores. Mining and the reduction processes are interdependent; any measure which affects one adversely is detrimental to both.

Continuous operation of smelters is of course contingent upon sufficient ore receipts. Few smelters in the United States at this time are fortunate enough to have such receipts. This insufficiency adds to the difficulties and to the expense. The additional cost entailed by the proposed 6-hour day and 30-hour week, added to the difficulties arising from irregular supplies, must necessarily be reflected in the price received by the miner for his product. The cumulative effect of this increased cost of smelting, added to the increased cost of mining, would bear heavily upon the mine operator.

The products of the mining industry are basic raw materials, the prices of which are largely fixed in international markets. In some cases it would perhaps be possible to pass the increased

cost on to the consumer, but with most mineral commodities the major part of the increased cost would undoubtedly fall upon the producer. This is particularly true where foreign competition is a factor, as it is in most cases, and where large excess stocks are now on hand. With the present large domestic stocks of non-ferrous metals, for example, a rise in price commensurate with the increase entailed by this bill can scarcely be hoped for. Prices of metals and minerals usually change slowly, whereas the increase in costs would be immediately effective.

Many mines have been operating at a loss in order to give employment and to avoid the heavy expense of a shut-down. Other mines have recently reopened in the hope that conditions were improving sufficiently to enable them to operate. The imposition of increased cost through the proposed law would reduce or wipe out the present slight margin of some mines, and increase the operating loss of others, and would cause many properties, employing large numbers of men, to suspend operations. Other mines which are now contemplating reopening would find any possibility of doing so indefinitely postponed. These statements are substantiated by representative telegrams from many mining companies and associations which we wish to submit for the record in this hearing.

The proposed law would inevitably cause a shift to those materials in which the smallest amount of labor is employed. Thus, anthracite and bituminous coal, in which the direct labor cost is 60 to 70 percent of the total cost of production, would suffer further loss of business to oil and gas, which have a very small proportion of labor cost. Within the anthracite and bituminous coal industries themselves, as well as in the iron ore industry, the copper industry, and others, there would be a pronounced tendency to increase the production of the open-pit or strip mines, in which large power-driven shovels are used, with the employment of comparatively few men and a high production per man. There would be a corresponding decrease in the production of the underground mines, which have a lower production per man, and in which far more men are employed.

It should be borne in mind that many mines, both coal and metal, are now operating only three or four days a week. Even if under the proposed law, with its higher costs, they should still be able to produce and sell as much ore or coal as at the present time, they would simply give their present employees an additional half day's or day's work per week, and would not add any men to the payroll.

In view of all these conditions, it can be stated definitely that the proposed law would result in a net decrease rather than an increase of employment.

The seasonal nature of certain parts of the mining industry should also be given serious consideration. This applies particularly to coal mines, for which storage of the product is impracticable, and which can only be operated to meet demand as it arises. Open-pit and dredging operations in the colder parts of the country and Alaska, and many of the smaller mines located in mountainous regions, cannot be operated in the winter months. In order that the men dependent on such mines may earn an adequate annual wage, to support them during the periods that the mines are not operating,



Julian D. Conover

it is imperative that their weekly hours during the periods when it is possible for them to work should not be unduly reduced. In such cases, to spread the small amount of work available over a larger number of men would be manifestly unfair, and would result in totally insufficient annual earning power for all men employed.

With present excess capacity, the development of new ore bodies may not seem to be important at this time, yet we must not lose sight of the fact that mining is a wasting industry, that the present ore bodies will eventually be exhausted, and that if no new deposits are developed to take the place of those now being mined, we may find our great manufacturing industries without adequate supplies of certain raw materials needed for operation. The development of new ore bodies ordinarily requires several years. It carries risks which will not be undertaken if the costs of such work are made prohibitive through legislation such as here proposed. The purpose of this bill is to increase and not to stifle employment. Market demand limits the amount of employment in the extraction or production of minerals, but there is no limit to employment in the field of exploration and development of new mines. A large proportion of the present unemployment in the mining field has been caused by the discontinuance of prospecting and development, and the proposed 30-hour week would intensify rather than alleviate this condition.

The general effect of the proposed law on the mineral resources of the country would be distinctly wasteful and anti-conservational. Increased costs would in many cases force the practice of selective mining, that is, the taking out of only the richer portions of ore-bodies—leaving behind the associated lower grade material which, due to caving of workings and other causes, would frequently never be recovered. Some of the mines forced to shut down would never reopen at all because of the high cost of re-equipping, re-timbering, and dewatering which could not be amortized over the

remaining ore reserves. It should also be borne in mind that the practice of selective mining, involving extraction of the higher grade ores, results in the employment of fewer men per unit of product.

When it is considered that nearly half of the population in some of our western states and large communities in the middle western, eastern and southern states are dependent, directly or indirectly, on the operations of mines, it is evident that the results of legislation such as is being considered would be of a most serious and far-reaching character. In many of these communities the mines afford the only means of livelihood, and when they are closed the entire population is left without means of subsistence.

In closing, Mr. Conover presented a large number of telegrams from mining companies and associations in all parts of the country, pointing out the serious effect which enactment of the six-hour day and 30-hour week bill would have upon the mining industry and those employed in it.

In view of the increasing importance of the problem of dust control in mining and other industries, and in line with its policy of testing respiratory protective equipment for permissibility for use in mines and in the mineral industry, the United States Bureau of Mines has formulated a series of tests for determining the efficacy of filter-type respirators designed for use against mechanically generated dusts, fumes of various metals, and mists. These tests are described in Schedule 21, "Procedure for Testing Filter-Type Dust, Fume, and Mist Respirators for Permissibility."

Up to February 15, 1935, four respirators have been approved by the United States Bureau of Mines for permissibility against Type A (dusts) suspensions of atmospheric particulate matter. These respirators are:

1. M. S. A. Comfo Respirator made by Mine Safety Appliances Co., Pittsburgh, Pa. Approval number BM-2101.
2. Willson Bag Respirator No. 300 made by Willson Products, Inc., Reading, Pa. Approval number BM-2102.
3. Willson Bag Respirator No. 400 made by Willson Products, Inc., Reading, Pa. Approval number BM-2103.
4. Pulmosan M-15 Respirator made by Pulmosan Safety Equipment Corp., Brooklyn, N. Y. Approval number BM-2104.

Several other respirators have been submitted and approval tests are in progress.

THE College of Engineering of the University of Illinois, through its Department of Mining and Metallurgical Engineering and Department of Mechanical Engineering, will conduct another Short Course in Coal Utilization at Urbana, June 11-12-13, 1935. No charge will be made for tuition or registration. The program will probably be announced by April 1.

National Committee Rehabilitation

BUREAU OF MINES

THIS special committee of The American Mining Congress, operating under the direction of Eugene McAuliffe, president, Union Pacific Coal Company, and a director of the sponsoring organization, has actively prosecuted its endeavors looking to adequate appropriations to enable the Bureau to serve the mineral industries.

One of the first activities of the committee was the compilation and release of a splendid publication *The Unseen Empire*, which gave facts and figures concerning minerals, designed to bring about a better public understanding of the importance of this industry to our industrial prosperity. In all, approximately 12,500 copies of this booklet have been distributed and wide publicity has been given to the material presented therein.

Appropriations for the U. S. Bureau of Mines and the U. S. Geological Survey are included in the Appropriations bill under the Department of the Interior. The appropriations proposed are entirely inadequate for the work of the Bureau, and the committee is diligently endeavoring to secure further consideration.

Julian D. Conover, secretary, The American Mining Congress, in a letter to the Honorable James P. Buchanan, chairman of the Appropriations Committee of the House of Representatives, pointed out that:

"The mineral industry forms the source of half of the nation's wealth; it furnishes, directly or indirectly, the livelihood of some 25 million people; it pays approximately \$200,000,000 annually in Federal taxes, and furnishes 55 percent of the total freight revenue of the railroads. Yet the total appropriation for the Bureau of Mines, the representative of this industry in the Federal Government, which averaged only \$2,125,577 during the period 1924-1928, was reduced last year to only \$1,214,926—a sum far from sufficient to carry out its essential and vitally needed activities. The proposed appropriations in the Interior Department bill are entirely inadequate to enable the Bureau to function effectively, particularly in view of the transfer to it of certain services from other departments.

"The activities of the Bureau of Mines have been curtailed, in our judgment, to the point of actual danger to the welfare of the mineral industry and the workmen engaged in it. We are deeply

concerned in this Bureau's resuming its various important services, among which we might refer particularly to:

"1. Its work in safeguarding the health and lives of mine workers, including its mine rescue and first aid training, which is indispensable in guarding against loss of life from mine disasters, but is now largely crippled through lack of funds:



Eugene McAuliffe

"2. Its technologic work, resulting in improved efficiency in the production of minerals, and the development of new processes and products; among other things this embodies work of material assistance to the small producers of gold and silver, and other minerals throughout the United States;

"3. Its economic branch, to which the industry looks for information and guidance in many of its problems, both those which are at present acute and those involving long-range future planning.

"We respectfully urge that the current year's appropriation for the Bureau of Mines be not less than \$2,000,000, to be expended under plans formulated by the director of the Bureau, who has our sincere confidence and respect."

United States Senator, James J. Davis, of Pennsylvania, in the *Congressional Record* of February 6, discussed the rescue work of the Bureau of Mines, in part saying:

"We in Pennsylvania are very much interested in mining. Nearly 400,000 workers in Pennsylvania make their livelihood through mining, and the people of Pennsylvania are awakening to the fact that the mineral industry has, in the past, been receiving too little consideration from the Government. Let us restore the appropriations, especially the appropriation to the Bureau of Mines for safety work.

"Mr. President, I have received the following letter from the Bureau of Mines, which I desire to read:

UNITED STATES DEPARTMENT OF THE
INTERIOR, BUREAU OF MINES

Washington, February 5, 1935.

Hon. James J. Davis,
United States Senate,
Washington, D. C.

Dear Senator Davis: Replying to your letter of February 2, I am sending you material that I hope may be useful to you in your address to the Senate. I regret very much that there was a delay in getting this to you. Mr. Dan Harrington, chief of the Health and Safety Branch of the Bureau of Mines, was absent in Harrisburg yesterday in conference with Mr. Hartneady, secretary of mines of Pennsylvania, and meeting with several others, discussing health and safety subjects, and particularly the recent serious disaster in the anthracite region.

The typewritten memorandum attached has been prepared by Mr. Harrington and Mr. Leopold. It contains accurate statistics and description of the effects of reduced appropriations upon health and safety work.

I also enclose a clipping which contains an accurate and well-phrased statement.

Cordially yours,
JOHN W. FINCH,
Director.'

"Some of the dire effects of the cutting of the appropriations for the health and safety work of the United States Bureau of Mines are seen in the following figures. The appropriations for this work for the past several years having been as follows:

1930	\$748,130
1931	769,170
1932	793,180
1933	741,325
1934	614,000
1935	452,000

"In the same years the number of persons in the mining and allied industries given the Bureau of Mines life-saving courses in first aid and mine rescue were:

1930	113,358
1931	112,220
1932	99,163
1933	74,501
1934	56,728

"It is easy to see what a harmful effect such very heavy decrease in this humanitarian work is bound to have. Just think of it, a drop from 113,358 life-saving courses in mining in 1930 to 56,728 in 1934. My own state of Pennsylvania has suffered in even greater proportion than other states, as may be seen from the following figures on these life-saving courses for the same years:

1930	18,367
1931	24,657
1932	17,661
1933	18,392
1934	6,294

"In 1930 the Bureau of Mines had 11 mine-rescue cars fully manned and equipped scattered through the various mining districts of the United States and Alaska. In normal times they were engaged in giving educational courses in health and safety to our mining people. These cars and their work were the admiration and envy of the entire world. Today only two of these cars are able to work, the others being thrown on railroad sidetracks in various parts of the United States, some to go into rust because of the parsimonious policy of the Federal Government in ruthlessly cutting appropriations for this humanitarian work. The great mining states west of the Mississippi River now have not a single one of these Federal mine-rescue cars doing the wonderful work which they are capable of doing if the funds were available to keep the cars working.

"Largely as the result of the wonderful work of the Bureau of Mines in forwarding the health and safety of our mine workers during the past few years, we have been relatively free of the terrible mine explosion disasters which only a few years ago used to cause the people of the United States to shudder in horror. In 1933 there was but one major explosion in the coal mines of the United States, and in that only 7 lives were lost; in 1934 there was but one, 17 persons being killed.

"This year, however, has started out badly, as there was a major explosion at Gilberton, a little town in Pennsylvania, in January with 12 fatalities, and there is but little hope that the good records of 1933 and 1934 can be repeated. Surely the people of the United States do not want to allow our mines again to go back to the conditions of the past when every year had its hundreds of miners wiped out of existence by these terrible explosion disasters. Unless we wake up and give our Bureau of Mines the support it needs and ought to have, we are very likely at frequent intervals to be confronted with headlines in our daily papers announcing mine explosion catastrophes with scores, possibly with hundreds, of lives cut off at an instant's notice, and with scores, possibly hundreds, of loved ones mourning the departed ones and deprived of their bread and butter. Surely a far better even a far cheaper way would be to give the health and safety work of the Bureau of Mines the



Honorable Abe Murdock

support it used to have and should have now.

"Is it right and just to the 400,000 workers who are engaged in mining in the State of Pennsylvania that there will be no mine rescue cars in the largest coal-producing State in the Union?

"It is thoroughly understood, of course, that what we are pleading for now in Pennsylvania and for the rest of the country is an adequate appropriation for the operating of mine rescue cars and stations and investigation of mine accidents; for the investigation and improvement of mine rescue and first-aid methods and appliances and the teaching of mine safety, rescue, and first-aid methods; investigations as to the causes of mine explosions, causes of falls of roof and coal, methods of mining, especially in relation to the safety of miners, the appliances best adapted to prevent accidents, the possible improvements of conditions under which mining operations are carried on, the use of explosives and electricity, the prevention of accidents, statistical studies and reports relating to mine accidents, and other inquiries and technologic investigations pertinent to the mining industry; the exchange in part payment for operation, maintenance, and repair of mine rescue trucks; the construction of temporary structures, and the repair, maintenance, and operation of rescue cars and Government-owned mine rescue stations and appurtenances thereto.

"The Bureau of Mines has trained nearly 800,000 persons in first-aid methods—in what to do during those first few minutes after an accident before the doctor comes, when proper treatment will often save a hand or leg or even save a life. It has trained more than 50,000 miners in methods of entering a mine after an explosion to rescue any miners who may be yet alive. And it has examined many hundreds of mines to recommend ways of correcting unsafe practices, if such be used.

"Before the Bureau of Mines was created in 1910 at least 2,000 persons were killed each year by accidents in the mineral industries and at least 120,000 were injured. Today the number killed is less than 1,500 a year and the number injured is less than 75,000. More than four workers every day are killed in the mines. There is no doubt that part of this improvement—and perhaps a very large part—is due to the Bureau's efforts to see to it that the miner does come out of the mine safe and sound."

The Honorable Abe Murdock, Congressman from Utah, on March 1, 1935, speaking before the House of Representatives in behalf of the appropriations for the Bureau of Mines stated:

"Not only in Utah, but throughout the entire Rocky Mountain area, the mining industry is of paramount economic importance. The prosperity of the people of that area is almost wholly dependent upon the prosperity of the mining industry. No one has yet guessed at the incalculable wealth that is locked away in the mountains of our inland empire; but it is not too much to say that the future glory and greatness of our country will come largely from that area. America's stake in the mining industry is great beyond all measure. It is the duty of American political leaders to take cognizance of the importance of that industry. We cannot, we must not, lose our stake in mining. And the time has come when the Government must awaken to the needs of the mining industry and take steps to bring about a saner and more orderly utilization of our mineral wealth in the interests of the whole people.

"During the years 1924 to 1928 the mining industry paid in Federal taxes almost six times as much as the agricultural industry. During those same years the Federal Government spent almost 50 times as much to protect agriculture as it spent to protect our mines. The mineral industry has stood on its own legs and has solved its own problems—sometimes wisely, sometimes unwisely. It does not ask for subsidies nor doles. It merely asks that the Government aid it with its technological problems and with those problems which involve the safety and welfare of mining labor. Only two Government agencies—the Bureau of Mines and the Geological Survey—are concerned principally with mining problems. In the past they have performed invaluable services, and they have ordered their work so that in the future they can render even greater service to the mines and the miners and to the country at large.

"But previous Congresses have crippled their efforts by pennywise-dollar-foolish economies. It would be false economy, it would be blind leadership, to continue to imperil our stake in that industry, which produces half our wealth, by continuing these petty, unsubstantial so-called 'economies.'

The Chairman of the Senate and House Committees on Mines and Mining—The Honorable M. M. Logan, and the Honorable Joe L. Smith, have actively aided in the effort to rehabilitate the Bureau, each sending a personal letter to members of Congress calling attention to the importance of the mineral industry and urging that the Bureau be provided with adequate funds.

A further effort of the American Mining Congress Committee is the presentation in this issue of this Journal of the article on "The Economic Importance of the Mineral Industry of the United States." Reprints of this article will be furnished for distribution. A nominal handling charge is the only cost involved.

The facts presented by Mr. Conover to Mr. Buchanan warrant the most complete cooperation of mining men. Mining

(Concluded on page 78)

American Institute of Mining and Metallurgical Engineers Hold Annual Meeting

AT THE annual meeting of the American Institute of Mining & Metallurgical Engineers, Dr. Henry A. Buehler, of Rolla, Mo., state geologist and director of the Missouri Bureau of Geology and Mines, was elected president.

Other officers elected were as follows: Vice presidents, John M. Lovejoy, president of the Seaboard Oil Company, New York, and Paul D. Merica, International Nickel Company, New York; directors, Dr. Charles K. Leith, professor of geology at the University of Wisconsin; Edwin E. Ellis, vice president of the United States Steel Corporation; Wilbur Judson, vice president of the Texas Gulf Sulphur Company; Wilfred Sykes, Steel and Tube Company of America, and R. M. Roosevelt, vice president of the Eagle-Picher Lead Company.

The retiring president, Howard N. Eavenson in addressing the meeting said:

"As we know civilization today, those nations having the greatest supplies of mineral fuels are and evidently are destined to be in the future the most powerful and, if the power is used properly, the most civilized. Climatologists have decided that the four dominant controls governing the population of an area are temperature, rainfall, location and the amount of coal reserves, and it is a well demonstrated fact in Europe that areas having large coal production have much denser population than similar areas without coal.

"The most favorable temperature belts are in Asia, Europe and North America, the areas varying in the order named, but the main coal reserves are in the United States, Canada, China,

Germany and the United Kingdom, the first two countries having about 70 per cent of the world's total.

"The United States is most fortunate in respect to temperature, rainfall and coal and unless past criteria fail entirely, with these advantages and the character of its people, it should for many centuries maintain a dominant position in world affairs."

Dr. Leith, who is vice chairman of President Roosevelt's planning committee for a mineral policy discussing the problems of the mineral industry said:

"A review of conditions indicates a strong case for the public interest in mineral waste. The trouble is not so much in the slowness of technological improvements—advances in this field have been impressive—but in the economic and social condition under which

unrestricted competition in some of the mineral industries has caused overdevelopment, overproduction, huge wastes of raw materials and bad conditions of employment. This seems to be especially marked in oil, coal, copper, lead and zinc.

"The planning committee favors some form of price or production control. Monopoly control in the main is favorable to conservation, but it must necessarily be accompanied by Government safeguards and supervision.

"While the United States is better supplied with mineral resources than any other country on the globe, it still lacks in whole or in part a considerable number of important minerals.

"Some of these 'deficit' minerals are those especially needed for military manufacturing, and are called strategic or war minerals. Among this group are mercury, nickel, antimony, manganese, chronite, tungsten, tin and certain grades of mica."

The present position of the Federal Government with respect to the mineral industries, consideration of the world's gold ore reserves, and advances in the mining and metallurgical fields were among the topics of timely interest presented in 150 papers which constituted the program for the convention. These papers included discussion on Unusual New Mining Methods; American Potash and the Ability of This Country to Produce Our Requirements; Wet Mining, Better Ventilation, and Mechanical Loading Health Hazards; Improving Working Conditions; Minimizing Dust Hazards; Safety Programs in the Coal Industry; One Hundred Years' Iron Ore Supply; Location of Pay Dirt in Gold Areas of Southwest; and Aluminum Monel Metal, a new metal introduced by International Nickel Company.

The meeting was widely attended; the program was of the finest order, and in every way it was one of the most outstanding meetings of the Institute.

(Concluded on page 78)



Dr. Henry A. Buehler



Ralph Roosevelt



Dr. C. K. Leith



Howard N. Eavenson

MINING EVENTS

Coal

BY FAR the most important thing for coal this month has been the legislative situation and the hearings on the Coal Control Bill, sponsored by Senator Guffey, of Pennsylvania.

Closely allied with this situation is that of the wage scale negotiations which have been in progress in an effort to arrive at a wage agreement for the Appalachian fields, and to negotiate a national wage scale for bituminous coal prior to March 31, when all working agreements between operators and miners expire.

Washington has been a "second home" for the coal industry for months past, and bids fair for considerable attention for the next two months. Wage negotiations resume on March 11, and operators from each and every field will be in attendance, whether as negotiators or as observers.

Meantime there is anything but peace in the industry. We have with us, in addition to Mr. Guffey's bill, the companion legislation re-introduced in this session by Senator Hayden, of Arizona, similar to his bill of the last Congress but differing from the Guffey bill in certain respects. A comparison of these two bills will be given in this review. Also, there is the Wagner Labor Disputes bill which involves coal in no small measure.

Coal operators appeared before the Senate committee considering the 30-hour bill and added their protest to that of industry generally against this legislation. Louis C. Maderia, III, executive director of the Anthracite Institute, appeared before the committee and pointed out that "it would mean an addition of nearly \$3.50 a ton to the selling price of egg, stove and chestnut anthracite, such as used to heat homes." He said, "The industry has been paying wartime wages for the past 15 years and efforts to effect a reduction in accordance with economic trends have always been thwarted. The result is an excessively high labor cost of production, with loss of markets to substitute fuels such as oil, gas and electricity."

Operators, at the instigation of Eugene McAuliffe, president of the Union Pacific Coal Company, are organizing a committee of approximately 15 members representing the fields west of the Mississippi River, to sit in as observers when the Appalachian Wage Conference convenes March 11. It is understood that these operators are reluctant to leave these important negotiations wholly in the hands of the North-South group. It is possible that Illinois and Indiana also will be represented in Washington during these negotiations.

The Guffey-Snyder Coal Control bill, probably the most important piece of legislation of concern to the coal industry now before Congress, has been the subject of extended hearings before the Senate Interstate Commerce Committee. So great has been the desire of each side to get its story into the record, that it has been necessary to resort to night hearings.

The bill was introduced in both Houses of Congress January 24 by Senator Guffey in the Senate and Congressman Snyder in the House, both representatives coming from Pennsylvania, our largest coal producing state. The bill seeks, in general, to continue the present advantages gained under the coal code, but adds many additional features regarded with approval or alarm according to the

tions. He praised Appalachian Coals as an "heroic effort" but predicted it would run into difficulties under the anti-trust laws. He also quoted extensively from the report of the planning committee of the National Resources Board. Other representatives of the Mine Workers were Van A. Bittner, president of District 17, and Phillip Murray, vice president of the organization. Both highly recommended the Guffey bill.

The following coal men presented views. This record compiled from full reports by the National Coal Association is not complete inasmuch as hearings are still in progress, and this report is written as of March 1.

W. Gaston Caperton, Slab Fork, W. Va., president of the Slab Fork Coal Co., said the bill has theoretical possibilities worthy of consideration but that such theories are now being tried out under the NIRA and the Coal Code. He expressed the opinion that a year and a half is not sufficient time to provide a fair trial of the Coal Code and advocated its extension for a period of two years. He said he believed Section 7a to be constitutional but suggested it might be clarified.

R. H. Gross, chairman of the board, New River Company, with an annual production of around three million tons, appeared as a representative of the Smokeless Coal Operators Association and opposed the bill on the grounds that "we are not at this time in favor of permanent legislation to regulate production and sale of coal in the United States." He favored temporary legislation that would extend the NIRA for two years and cited the recommendations of the National Coal Association along that line, which were submitted to the National Recovery Board, January 28, 1935. "The code," he said, "has made it possible for the operators to pay good wages, to furnish coal to buyers and consumers at uniformly reasonable prices, provided more work for the men, and some earnings have been made by those owning the properties and furnishing the capital necessary to carry on the undertaking." He further said that he thought the bituminous coal industry in 1934 had operated at a greater percentage of normal capacity and paid better wages than any other natural resource industry of the country. He definitely opposed any plan which contemplates acquisition of coal mines or properties by the Government.

Jonas Waffle, of Terre Haute, Indiana, appearing on behalf of the Coal Trade Association of Indiana, embracing 95 percent of the coal production of that state, advocated the extension for a

ON RECOVERY ROAD



—The Washington News

district represented. It would set up a national commission to fix prices and wages and allocate tonnage. It proposes a tax of 25 per cent of the selling price of all coal, to pay the cost of administration. Ninety-nine percent of the tax would be remitted if the producers obey the commission. It seeks to have coal declared a public utility and carries a provision to purchase surplus coal-bearing lands.

The hearings opened with a statement by the United Mine Workers of America, who are actively sponsoring the bill. Their general counsel, Henry Warren, outlined the purposes of the bill, and discussed in detail its provisions stressing the effect upon labor. He advocated that coal be placed under Government control, and cited the report of the John Hays Hammond Coal Commission as a basis for his recommenda-



P. C. Thomas

period of two years of the Recovery Act and the Coal Code, which extension, he said his operators believe, would be more in the interests of the consumers, the general public, the mine workers, the residents of dependent mining communities, and the producers of coal, than would be the Guffey bill.

He told the committee the plan of price control provided in the bill, in the opinion of his people, would not work in practical application, and set forth the following reasons in support of that statement:

"Coal that is sold in the same general markets is produced at several hundreds of individual mines, scattered over an immense geographical area. There is a wide difference between the grades and qualities of these coals. There is a wide difference in the freight rates on which they are transported. There is a wide difference in their use value. There is a wide difference in the adaptability of these coals in various types of equipment in which they are utilized. There is a wide difference in the chemical content of the coals, the fusion temperature of the ash, the heat value, and numerous other elements. Under all of the circumstances and conditions cited, it is absolutely impossible to market coal except under a wide range of flexibility in price fixing, similar to that which prevails under the price control provisions of the Bituminous Coal Code."

Mr. Waffle told the committee that the inevitable result of the proposed method of price-fixing "will be chaos, confusion, constant hearings before the National Bituminous Coal Commission and endless litigation in the Federal courts." Regarding allocation and production control, he said, "Merely because this type of control has been in vogue in Great Britain and Germany, where conditions are entirely different from those in this country, does not furnish a valid reason for setting up in this land a plan of which little is known by the American coal producer." And added, "Most of the advocates of production control are activated by selfish

interest." From a practical standpoint, Mr. Waffle said, the bituminous coal industry has none of the aspects of a public utility and to so declare it would result in dual regulation which would not be in the public interest but on the contrary would adversely affect public interest. Concluding, he said, "We are of the opinion that specific legislation is inadvisable at this time; that it should be deferred until the industry has developed a broader experience under a two-year extension of the code, during which extension the question of whether specific legislation is desirable or necessary can be given careful study." "Such procedure," he added, "would avoid the enactment of hastily considered, ill-advised and unworkable legislation."

E. C. Perkins, Lexington, Ky., speaking for the Hazard Coal Operators Association, and in behalf of the small operations, voiced opposition to the bill. He told the committee that proponents of the bill had appeared at the hearing expressing the hope that the coal industry "would be helped through the destruction of the small operator." He



D. A. Thomas

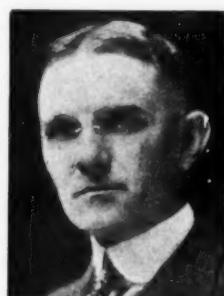
told the committee that the constructive benefits received by the coal industry under the Recovery Act should not be interfered with but continued, but, he added, if it should be in the cards that the Recovery Act is not to be renewed then the small operators, through counsel, would present several vital and important comments and amendments touching the Guffey bill. One of these amendments was the setting up of a district covering the Hazard field in the annex to the act, to be known as District 25.

D. A. Thomas, Birmingham, Ala., president of the Montevallo Coal Mining Company, speaking on behalf of the Alabama Mining Institute, representing 85 percent of the commercial coal produced in that state and practically all of the by-product coke, pig iron and steel production of Alabama, was the last witness at the afternoon session. "The result of the enactment of the Guffey bill,"

Mr. Thomas said, "would be an almost complete annihilation of the coal industry of Alabama and a serious crippling of the others, with attendant increases in unemployment; all of which will add to the paralyzed condition of the industrial activity in the State of Alabama." Referring to the terrific inroads in the market for Alabama coals made by competitive fuels and sources of energy, in response to inquiry by Senator Neely, Mr. Thomas stressed the present and future effect that the activities of the Tennessee Valley Authority would have upon coal mines and the labor employed therein.

Referring to the Coal Commission provided for in the bill, he expressed the fear that its activities might become a means of paying political debts at the cost of the industry and at the expense of the consumers of coal. He opposed the provision that the commission's findings of fact should be binding upon the courts. He termed premature the provision for the involuntary imposition of a code upon the industry, stating "the situation in the bituminous coal industry has not sufficiently crystallized to justify the writing of an inflexible code in the stern language of statute." In his section, Mr. Thomas said, it is a matter of record that since the adoption of the code the mines are charging the highest realization perhaps of any field east of the Mississippi River with the lowest wage scale perhaps east of the river and are continuing to lose money, and told the committee that Alabama was in no position, from a market standpoint, to have the price of its coal further increased. He emphasized the fact that the consumers of coal in that whole territory could not and would not pay an increased price for coal.

Huston St. Clair, Bluefield, W. Va., speaking as a representative of the Jewell Ridge Coal Co., Virginia Smokeless Coal Co., and Pocahontas Mining Corp., also told the committee that the bill, if enacted, would bring about a confiscation of property without due process of law. He expressed the belief that the quotas to be allotted the districts could not be equitably determined and told the committee that the bill, if enacted, would mean a loss to his company of 55 percent of its present production and that 500 of his employes would be made jobless. He favored the continuation of



J. D. Francis



A. Harry Moore



Sherman Minton



M. M. Neely



James J. Davis

Sub-committee of the Committee on Interstate Commerce of the Senate Considering the Guffey Coal Control Bill.

NIRA for an additional two-year period with such modifications as might be considered desirable in the belief that if the Guffey bill were capable of being enforced, then the provisions of NIRA can likewise be enforced.

Eugene McAuliffe, Omaha, Nebraska, president of the Union Pacific Coal Co., spoke as a representative also of Division V of the Bituminous Coal Code. The bill, he said, wholly disregards the needs and interests of the consumer on whose support the industry depends for its existence. He said the bill was written wholly in the interest of labor with such safeguards as would presumably meet the requirements of the owners and of labor employed in the mines; that if passed, the bill would increase the cost of railway fuel coal not less than 30 cents per ton; that there is no justification for Section 3 being made applicable to captive coal, and that the other branches of mining, particularly anthracite, are not included in the provisions of the bill. He referred to paragraph (b) Part I Section 4 and said the method set up for allotting tonnage was inequitable as variations in output have occurred during the period since 1918 and further that extended strikes, extreme variations in wages and production costs, and many other factors indicated the unfairness of the formula suggested. He estimated the cost of administering the bill at \$3,600,000 annually and stated that that was a minimum and in all probability it would be double that amount and that, in addition to that expense, the 10 cents per ton provided for in Section 9 Part II would "bankrupt many coal producers." Referring to paragraph (c) Part II "Marketing," he asked the committee if the writers of the bill were sincere in their efforts to declare coal a public utility, then why was a provision inserted in this paragraph that no information obtained from the producer should be made public without the consent of the producer from whom obtained? He expressed the belief that the conservation provisions of



Senator Jos. Guffey, Sponsoring the Coal Control Bill

the bill could very well be left to the U. S. Bureau of Mines.

J. D. Francis, Huntington, W. Va., speaking for his companies, the Island Creek Coal Company, the Mallory Coal Company, and the Pond Creek Pocahontas Company, opposed the bill, stating that "it would be detrimental to the producers, the miners and the public." He said he was in favor of limited, reasonable and proper legislation in the interest of the coal industry or some form of temporary legislation for the natural resource industries. "I believe," he said, "if legislation is passed it ought to be as simple as possible in order to be effective, and it should not attempt to regulate the industry in great detail and should be within constitutional limits." He cautioned the committee that if they were to enact legislation which later is declared unconstitutional by the courts, the coal industry would then be without any regulation, even that which now exists under the code, and that such a situation might throw the industry into a "panic."

He opposed the bill because it declared the industry to be a public utility, stating it is not a public utility

under any of the generally accepted terms. He opposed the allocation in the bill, telling the committee, however, that he agreed with the miners in their thought that if there is to be any detailed price control there would also have to be allocation. He wanted it understood that he was not advocating mandatory detailed price-fixing by the Government. He said both compulsory detailed price-fixing and allocation of tonnage are evils, but that if there is to be compulsory price-fixing there must also be allocation of tonnage; that they go hand in hand; that the problem of allocation is even more difficult within a given district than it is as between various producing districts. With respect to the district allotments provided for in the bill, he said the proposed allocation is inequitable, and expressed the view that if allocation is carried out it should be on the basis of a company's highest production during any single year of the last five years. With respect to Title II of the act, Mr. Francis expressed the opinion that the whole proposition was of doubtful legality. He said he did not favor the Government buying up coal lands not in active operation; that he thought to effect the purpose of the bill only "going mines" should be purchased by the Government so that such purchase would have the effect of curtailing production. In concluding his testimony Mr. Francis expressed general opposition to the bill, and expressed the opinion that organizations similar to Appalachian Coals, Inc., could accomplish most of the purposes of the Guffey bill through voluntary action while operating under the conditions laid down by the Supreme Court in its Appalachian Coals decision.

The U. S. Steel Corporation filed a brief on behalf of its coal producing subsidiaries in opposition to the bill. The steel corporation spokesman said that he would content himself with this procedure. The brief points out that no logical reason can be advanced why this single element, meaning the production of coal used in the manufacture of steel

COMPARATIVE ANALYSIS OF DIFFERENCE IN PROVISIONS
FEDERAL COAL CONTROL BILLS

Gufey (S. 1417)—Snyder (H. R. 4661) Bill

Hayden (S. 1922)—Lewis (H. R. 5856) Bill

	BITUMINOUS COAL MINING		ANTHRACITE AND BITUMINOUS COAL MINING	
Civil Service Clerical Employees	No		Yes	
Commission or Court	5 members—3 non-partisan, 1 representative of producers and 1 representative of labor. Initial term of office for only 4 members (?)	Page 2	5 non-partisan members	P. 4—Sec. 2
District Boards	Twenty-four 5 Producer and 1 labor member	P. 5—Part I (a) P. 6	Twenty-seven 10 Producer and 1 labor member	P. 6—2 (a) P. 7—2 (a)
Standard District Quota	Territory of districts may be modified by Commission	P. 6	Territory of districts may be modified by Council, subject to approval of Court	P. 6—2 (a)
Standard Mine Quota	Based on average annual output since 1918 and also output in 1934	P. 7 (b)	Based on average annual output 1919 to 1933 inclusive, and also output of 1934 May be modified by Court	P. 8—(b) P. 18—S. 5 (a)
Periodic District Quota	Figured in relation to Standard District Quota (?)	P. 8 (d)	Figured in relation to average annual output of District in 6-year period May be modified by Court	P. 9 (c) P. 18—S. 5 (a)
Periodic Mine Quota	Fixed by National Board under direction of Commission Appeal to Commission to increase	P. 7 (e) P. 8 (e)	Fixed by Coal Operators' Council. Appeal to Council to increase, Council to fix minimum quota for year in advance.	P. 10 (d) P. 40 (g) P. 38 (e)
Minimum Prices	Transferable only on approval of Commission	P. 9 (h)	District may deduct from periodic quota of any mine the tonnage by which mine during previous period exceeded quota.	P. 47 (o)
Maximum Prices	Fixed by Commission	P. 11— Part II (a)	District Board may provide for transfer of periodic quota by producers in the same class within the district.	P. 45 (n)
Marketing Agencies	To be based on cost taken to next highest even cent per ton. Excluding depreciation and depletion		Fixed by District Board, subject to revision by Council. In revision by Council, only representatives of bituminous or anthracite coal to vote on prices of respective kinds of coal.	P. 10 (f)
Arbitration Panel	Fixed by District Board subject to approval of Commission	P. 11—Part II (b)	Based on cost plus 25¢ per ton of bituminous and 50¢ per ton of anthracite	
Reports	Established by Code Members	P. 13—Part II (f)	Fixed by Court	P. 18—Sec. 5 (a)
Tax			Established by District Boards on request of majority of code members, or by Council on such request.	
Natl. Contracts For Hours of Work			To be set up by Council	P. 11 (g)
Confidential Matter	May be required by Commission		May be required by Commission, Council or District Board	P. 12 (h)
Freight Rates	Drawback of 99 percent	P. 4—Sec. 3	Drawback of 99 percent	P. 12 (j)
Mine Production in Excess of Periodic Quota	By representatives of one-half of workers and producers	P. 17 (g)	By representatives of two-thirds of workers and producers	P. 17—S. 4 (a)
Wage and Work Agreements	No penalty provided for violation of confidence		Penalty provided	P. 16 (g)
Captive Coal	(?)		Court may complain to I. C. C.	P. 18 (b)
Abandoned Mine			Loss of drawback on excess tonnage	P. 20—S. 6 (a)
Mining Practice			Court to encourage	P. 12 (j)
Penalties for Violation			Defined	P. 22—S. 8
Voting by Council	Not stated		Defined	P. 26 (e)
Coal Reserve	Bituminous coal land and rights	P. 24	Secretary of Interior to promulgate good mining practice	P. 10 (c)
	\$300,000,000 bond issue	P. 26—Sec. 8	Council may levy on District Boards for violation	P. 6 (S. 3) (1)
			See detail	P. 42 (i)
			Bituminous and anthracite coal lands and rights.	P. 43 (k)
			\$400,000,000 bond issue.	P. 27—II—Sec. 3
			Consent of state required for purchase.	P. 29—Sec. 8
				P. 27—Sec. 2

products, should be given special legislative treatment. He emphasized the fact that the steel mills use all the coal they produce and that their mines were not operated competitively with commercial mines. The brief contends that the tax provision is unlawful and cites court decisions to support the contention. It further brings out that the steel company owned mines do not operate under a code, but do pay wages equal to or above those paid by commercial mines. Other steel companies filing briefs in support of the U. S. Steel Corporation were: Bethlehem Steel Corporation, Jones & Laughlin, Republic Steel Corporation, Youngstown Sheet & Tube Company, Crucible Steel Company, Weirton Steel Company and Wheeling Steel Corporation.

P. C. Thomas, Pittsburgh, Pa., vice president of the Koppers Coal & Transportation Co., in whose behalf he spoke, voiced the opposition of 10 million tons of coal to the Guffey bill. At the outset he told the committee he was not prepared to talk on constitutionality, that he was not primarily a marketing man, but an operating man, and stated emphatically that "we cannot stand any further increase in the price of our coal if we are to continue to employ men and continue our operations." He added that any such increase in the cost of coal to their consumers could mean only one thing, namely, a further intensive mechanization of the mines and resultant unemployment. The Koppers interests, he said, oppose the bill and favor the continuation of NRA for two years with the amendments proposed by the National Coal Association and any other strengthening amendments that Congress approves. He viewed the allocation provisions as unsound and uneconomic and "not necessary for the stabilization of the industry." The price control provisions, he said, would ruin certain producers, and, at the same time, offer no advantages to the industry as a whole over the present method of fixing prices under the code. He said the provisions for a National Coal Reserve were unworkable and "certainly unwise."

Charles O'Neil, president, Eastern Bituminous Coal Association, representing producers in central and eastern Pennsylvania, Maryland, and the upper Potomac region of West Virginia, said this group favors the general principles underlying the Guffey bill and is of the opinion that Federal control of the coal industry is essential to securing that degree of regulation that is necessary to protect the interests of the consuming public, the mine workers, and the producers." This statement was qualified to the effect that the Clearfield Bituminous Coal Corporation wished it announced that it is opposed to the Guffey bill. He favored some of the provisions of the Guffey bill and definitely objected to others. "It is against all human experience and all rational thought to believe that the price of bituminous coal can be artificially controlled, unless

WITH HIS ORDERS IN HIS HAND!



—Washington Daily News

something be done to remove the weight of over-capacity from the price structure," he said. Regarding allocation, he said that he believed a basis must be determined by superior authority and that he had no great objection to the basis provided in the Guffey bill or to any other basis which does not unduly disturb the tonnage relationships of the various districts which existed in 1934. He termed objectionable the declaration in Section 1 that the coal industry be regulated as a public utility, but said he felt that the industry could be regulated based on the precept that it is affected with the public interest. He said he felt the Coal Commission provided for in Section 2 and the Labor Board provided for in Part III of Section 4 should consist entirely of disinterested and impartial members and not contain representatives directly connected with either the producers or employes. He recommended the line be changed to distinguish between a definite refusal in connection with the drawback features of Section 3 and minor unintentional violations of the act. He objected to a bare majority of the industry fixing minimum wages and maximum hours, as provided in subsection (g), Part III, Section 4. He expressed the view that the membership of the National Coal Producers Board, which under the act as presently drawn would embody 35 persons, would be unwieldy and incapable of prompt and expeditious action. In connection with subsection (f) of Part III of Section 4, he suggested expansion so that joint marketing agencies should be made permissible under suitable limitations. He recommended incorporation in the act of the unfair trade practices now defined in the Coal Code, and that the National Bituminous Coal Commission be empowered to hear and determine complaints alleging their perpetration. He said his group had not had ample time to give intensive study to the provisions of

Title II and their effect upon the industry, and that, pending such further consideration, he suggested the subject matter of that Title might be given further consideration in connection with the subject committed to the commission under Section 13 of Part I of the act. He expressed the view that the industry was not in a position to bear the imposition of a 10 cents per ton addition to its cost of production at this time.

William Emery, Jr., speaking for the Ohio Coal Control Association, objected to prefacing the bill upon the theory that coal was a public utility. In connection with Section 2 he cited two objections, (a) that the Coal Commission should consist of impartial and disinterested members, and (b) that the personnel of five members provided for in the bill should be at least seven and possibly nine or eleven, and that matters coming before the commission should be handled in the same manner as the procedure before the Interstate Commerce Commission. He also advocated a distinction in Section 3 between intentional and unintentional or careless violations coming within the scope of the penalty. Referring to Section 4 as containing untried and experimental provisions, he recommended that they be put into effect for a temporary period of two years, subject to modification during or at the expiration of that period. Part I, "Production," (a): He felt the board should have the power of appointing an executive committee, fully representative of the industry as a whole, with power to act subject to the approval of the commission. Subsection (b): He said he did not feel a hard and fast rule could be laid down as to allocation. "We are in favor of an equitable method of allocation, in the belief that production control is essential," he said. He advocated a temporary system of allocation, for probably six months, during which time the commission should consider and investigate its workings, following which it could perhaps be modified and made effective for 18 months—any such modification, however, to be subject to approval of two thirds of the tonnage of the country. Subsection (d): He objected strenuously to the allocation of standard quotas to mines within the respective districts. Part II, "Marketing," (a): He objected to rigid fixing of a minimum price on the basis of cost only, in the belief that in the fixing of any price competitive conditions must be considered. Subsections (d) and (e) he termed weak, and advocated the inclusion of at least those unfair practices contained in Article VI, Section 6, of the Coal Code, Part III, "Labor Relations": While approving the establishment of maximum daily and weekly hours, he expressed opposition to their establishment by the producers of a bare majority of the tonnage and suggested that their establishment should require the approval of at least two-thirds, if not three-fourths. With regard to Title II he said it would be suicidal to the industry to

further elevate the sales price of coal, as the loss to competitive fuels would thereby be further increased.

John G. Hoffstot, president, Lincoln Gas Coal Co., Pittsburgh, Pa., said he favored the principles of the bill but suggested its provisions should cover the producer, wholesaler, and retailer, and each should be defined and assessed his proportion of the tax; that consideration should be given to the elimination of the national board of producers as well as the district boards, which should be replaced with a deputy commissioner for each of the 21 or 24 districts. In arriving at quotas he suggested the elimination of the four years of depression, taking the production prior to 1929. He favored Title II as amended by Mr. Hossford, opining that the tax provided therein would create no burden upon the consumer, due to the bringing about of more regular and efficient operation of the mines.

Copper

PERCY E. BARBOUR—well known mining authority in a recent issue of the *Annalist*, reviewed the copper industry in 1934. We quote in part:

"Owing to the complexity of the copper situation and the many diverse factors entering into it, an appraisal of the year 1934 and of the outlook depends entirely on whether one takes a view of the year in retrospect or a long-range view of future business recovery and also on whether the estimate is made from a domestic or foreign standpoint.

"In this country mine production was less than the year before (according to Copper Institute figures), but there was a very material reduction in refined stocks and there was a substantial betterment in price. There was also a moderate increase in consumption despite the fact that general business conditions during the last six months of the year were far from heartening.

"Abroad the consumption of copper increased markedly, reaching the highest ever recorded, general recovery there having far outdistanced that in the United States. However, foreign mine production also increased to a new high record; Canada and Rhodesia produced more than ever before. Moreover, foreign plans for increases in production and plant, if carried out, indicate a still further large increase in 1935. But despite the great improvement in foreign consumption and production, the world price at which the foreign production was sold was very low on the average and reached a bottom of 6.075 cents, New York export price, which is equivalent to a gold-dust price of 3.584 cents, with a 59-cent depreciated dollar.

"The most outstanding event in the copper situation domestically was the adoption of an NRA Copper Code with provisions for restrictions of production and fixing of prices, both of which have been done.

"Copper started the year at a price of 8.025 cents per pound New York refineries; the corresponding export price

	REFINED AND BLISTER COPPER (SHORT TONS—2,000 POUNDS)				†Stocks U. S. A.
	Production U. S. A.	Production World	Consumption U. S. A.	Consumption World	
1922.....	511,970	996,147	552,046	1,095,811	288,500
1923.....	754,000	1,411,980	730,728	1,331,040	348,000
1924.....	819,000	1,522,394	756,579	1,491,923	318,000
1925.....	854,000	1,589,717	813,497	1,673,843	278,000
1926.....	878,000	1,637,489	904,217	1,726,532	300,500
1927.....	847,419	1,682,361	825,182	1,758,058	286,000
1928.....	935,199	1,892,350	983,472	2,009,383	268,500
1929.....	1,026,348	2,130,589	1,119,386	2,084,560	403,000
1930.....	710,690	1,734,745	808,758	1,714,187	532,500
1931.....	524,631	1,487,992	600,753	1,406,535	636,300
1932.....	255,509	994,238	335,981	1,080,695	691,000
1933.....	233,649	1,114,740	381,726	1,242,183	600,500
1934*.....	225,800	1,278,000	440,000	1,577,000	373,250

* Estimated. † December 31 of each year.

was 8.050 cents. During February and March it held at 7.775 cents. It was advanced in four steps to 8.775 cents the early part of June under the code aegis and remained there throughout the remainder of the year.

"According to figures of the Copper Institute, the domestic monthly production of mines varied from 15,500 to 20,250 tons monthly. The indicated total for the full year is 225,800 tons, compared with 233,649 tons in 1933 and 255,509 tons in the year previous.

"Foreign mine production increased more or less regularly from 57,000 tons at the beginning to 84,000 tons in November. The total of foreign mine production is estimated at 1,053,000 tons, compared with 911,991 tons in 1933 and 738,729 tons the previous year.

"World stocks of refined copper in the hands of refiners on January 1, 1935, as estimated by the Copper Institute, were 494,300 tons, as compared with 642,000 tons on January 31, 1934. Stocks in foreign bonded warehouses amounted to 41,984 tons. At the end of November the world stocks in refiners' hands were 483,500 tons, showing a decrease for 11 months of 158,500 tons. An increase in stocks was looked for during the last month and the total decrease for the year is estimated at 152,000 tons. Most of this was in United States stocks. The Bureau of Mines figures give total smelter and refining stocks in the United States at the end of 1934 as 462,000 tons, as against 600,500 tons at the end of 1933, a decrease of 137,500 tons.

"Stocks in bonded warehouses in England were 53,807 tons on December 15. Stocks in United States warehouses increased from 11,876 to 24,696 tons. Hence the world visible stocks at the end of the year are estimated at 550,000 tons. This is equivalent to more than a year's domestic supply at the present rate of consumption, and nearly six months' world supply.

"Domestic consumption for the year, including secondary copper produced by primary plants, is estimated at 440,000 tons, as compared with 381,726 tons in 1933 and with 335,981 tons the previous year.

"Foreign consumption for the year is estimated at 1,137,000 tons, compared with 744,714 tons in 1933 and 965,174 tons in 1929, the boom year."

COPPER, oldest of the metals of commerce, is today being employed for a wide variety of new uses which is increasing its consumption in fields heretofore largely held by other materials. Where a white finish is desired, chromium is utilized on a base of copper or its alloys. This age-old metal, because of its rustproof properties, gives exceptionally long life to its coat of shining white or satin.

Chromium on copper is being extensively used for exterior construction, including entrances and store fronts, electric signs, window frames, and for exterior trim and decorative effects.

The vogue for white has invaded the home. Housewives are equipping their kitchens with chromium cooking utensils, the base metal being copper. The chromium luster with copper is used for every cooking purpose ranging from teakettles with a bird that whistles when the water boils, to drip coffee pots, percolators, griddles, pots and pans. Even the kitchen sinks are made from chromium on copper.

The living room, dining room, and bedroom as well as the den are replete with numerous chromium articles. These include giftware articles such as lighting fixtures, candlesticks, flower pots, fruit bowls, vases, lamps, magazine racks, mint and nut dishes, cigar and cigarette stands, lighters and cases, buffet servers, cocktail sets, and scores of others.

Chromium on copper is very much in fashion as part of milady's apparel. These include mesh bags, hats, belts, collars and other ornamentations. Even full-length evening gowns of stunning effect are created. Compacts and lipsticks are popular in this finish.

Automobile manufacturers are among the captains of industry that have turned to chromium on a base of copper for many parts. The automobile is subject to the rigors of all kinds of weather and it is essential that rustproof metals must be used for specific purposes. Among the uses of the white metal in this industry are headlights, hub caps, hardware trim, and other purposes.

Hotels, restaurants, theaters, and office buildings are using chromium for furniture, decorations, and other purposes.

PHELPS DODGE CORP. has sold National Electric Products Corp. to W. C. Robinson and associates. The business and plant sold are what formerly constituted the National Metal Molding Co. American Copper Products Corp. and National Metal Molding Co. were merged to form National Electric Products Corp.

In October, 1930, Phelps Dodge acquired National Electric Products, and formed Phelps Dodge Copper Products out of American Copper Products and Habirshaw, Inc., etc. National Metal Molding plants have been operated as a separate subsidiary. This subsidiary, which was managed by Mr. Robinson, is the largest steel conduit company in the world. It also does some copper wire business. It is because the steel conduit business did not fit in with Phelps Dodge's copper business and also because there was duplication of sales forces so that National Metal Molding salesmen and Phelps Dodge Copper Products men found themselves occasionally bidding against themselves, that Phelps Dodge Corp. decided to dispose of the National Metal Molding Division.—*Wall Street Journal*.

THE AMERICAN BRASS CO. has issued a booklet describing Anaconda Beryllium copper, a heat-treatable alloy possessing exceptional physical properties.

It is not generally known that the company has been producing this product in increasing amounts over the past two years and that it is meeting with general acceptance in many uses. When heat treated, it has a strength of over 200,000 pounds per square inch, a Brinell hardness of 360 or more, and a fatigue limit of well above 40,000 pounds per square inch. The book gives the composition, forms available, and application; it also describes fabricating procedure, soldering, welding plating, mechanical properties, while illustrating a number of products in which it is now being used.

H. M. RICE, metallurgist and manager of the Nichols Copper Company, Chicago, a unit of the Phelps Dodge Corporation, announces that a new chemical process has been discovered for reducing copper to a noncrystalline form suitable to use in a liquid vehicle and giving in effect the equivalent of liquid copper.

The metal, 98.3 percent pure, can now be applied in this liquid form, Mr. Rice reports, to create a virtual sheath or armor of copper upon almost any surface. The new product is not to be confused with the common copper oxides or bronze powders, Mr. Rice points out.

By virtue of the shapeless form of the tiny copper particles which are so small that they penetrate a 350-mesh screen, no minute gaps are left in the coating after application by spraying, dipping, or by a brush, it is said. The copper remains in suspension in the special vehicle which has been developed, assuming an approach to a semi-colloidal state.

Laboratory and field tests indicate that the product should have a useful life of 5 to 10 years and longer, it is reported. It is also highly resistant to acid and other forms of corrosion. Discovery of the process is credited to two university scientists who worked in a private laboratory in Chicago for more than eight years before finally achieving their goal.—*American Metal Market*.

Gold and Silver

PRODUCTION of silver from mines in the United States jumped almost 1,000,000 ounces in December, compared with the previous month, to the highest figure to be reported for any one month since March, 1931, according to the monthly statistics of silver production compiled by the American Bureau of Metal Statistics.

With the American silver purchase program one year old, as far as the

A THREE-CORNERED RACE FROM NOW ON



—The Washington Herald

64½-cent price for domestic output is concerned, the increase in United States production in 1934 was greater than for any other of the three major producers. With December closing out the year 87 percent higher than December, 1933, American output for 1934 was 26 percent higher than for 1933. Mexico showed an increase of 9 percent for the year and Canada 3 percent, while increase for the entire world was 12 percent.

A total of 2,917,000 ounces was produced in December, compared with 1,976,000 in November and 1,562,000 in December, 1933. This is the highest since 3,528,000 was reported for March, 1931. Mexican output for December showed little change, with the estimate at 6,400,000 compared with 6,241,000 ounces in November and 6,000,000 a year ago, while corresponding figures for

Canada were 1,187,000, 1,517,000, and 1,131,000 ounces. World production for December was figured at 16,204,000 ounces, compared with 15,269,000 in November, and 13,558,000 in December, 1933. World December output was the highest since 2,389,000 was reported last April.

The Bureau's report confirmed other estimates of a substantial increase in the world production of silver for 1934, which proved to be the biggest year for silver producers all over the world since 1930. Total output is placed at 180,501,000 fine ounces, compared with 161,360,000 in 1933, and 169,232,000 in 1932.

Imports of refined silver bullion again dropped slightly during December, amounting to 10,902,000 ounces compared with 13,246,000 in November and the peak for the year of 37,091,000 in August. December's total, however, was sufficient to establish 1934 as a new high year for this type of imports, at 141,747,000 fine ounces, compared with 141,078,000 in 1933 and 34,874,000 in 1932. Imports of ore and base bullion increased to 34,162,000 ounces for 1934 from 21,373,000 in 1933 and 24,426,000 for 1932.

Imports of foreign silver coin dropped sharply in December, being valued at \$1,207,266, compared with the peak of \$6,120,886 in November. This probably reflects the dwindling Chinese exports of silver coin due to the export duty imposed in mid-October. Despite this, imports of foreign silver coin for the year set a new record at \$16,259,007, compared with \$2,574,510 in 1933 and \$1,119,445 in 1932. Imports of United States silver coin, on the other hand, dropped to only \$759,019, compared with \$1,008,056 in 1933 and \$1,771,807 in 1932.

The only export of silver from New York in December was a miscellaneous lot of 5,000 ounces. None was shipped from San Francisco. The reversal of the normal flow of silver is shown by export figures for the entire country, which show that total exports of refined silver bullion from the United States during 1934 amounted to only 21,723,899 fine ounces, compared with 43,275,553 in 1933, 42,287,058 in 1932, 82,904,646 in 1931, and 131,519,993 in 1930.—*Wall Street Journal*.

ON JULY 20, 1933, 66 Governments at the World Economic and Monetary Conference at London, adopted the resolution proposed by the United States that these Governments refrain from the policy and practice of melting up and debasing silver coins, that they replace low-valued paper money with silver coins, and that they enact no legislation that would depreciate the value of silver in the world market. A separate and supplemental agreement was entered into, at the instance of representatives of the United States, between China, India, and Spain, the holders and users of large quantities of silver on the one hand, and Australia, Canada, Mexico, Peru, and the United States on the other hand, as the chief producers of silver. Under this arrangement China agreed not to dispose of any silver derived from

the melting up or debasement of silver coins, India agreed not to dispose of over 35,000,000 ounces of silver per annum during a period of four years commencing January 1, 1934, and Spain agreed not to dispose of over 5,000,000 ounces of silver annually. In consideration of such limitation it was agreed that the governments of the five producing countries would each absorb from the mines in their respective territories a certain amount of silver, the total amount to be absorbed being 35,000,000 ounces per annum during the four years commencing January 1, 1934. The silver so absorbed would be retained in each of the producing countries for the period of the agreement and used for coinage purposes or as reserves for currency or otherwise kept off the world market. It was understood that of the 35,000,000 ounces specified, the United States was to absorb annually at least 24,421,410 ounces of the silver produced in the United States during the four-year period.

To comply with the London Agreement, on December 21, 1933, President Roosevelt proclaimed and directed that each United States coinage mint receive for coinage into standard silver dollars any silver which such mint, subject to regulations prescribed by the Secretary of the Treasury, is satisfied has been mined subsequently to the date of this proclamation from natural deposits in the United States or any place subject to the jurisdiction thereof. Of silver so received the Director of the Mint, with the voluntary consent of the owner, deducts and retains 50 percent as seigniorage and for services performed by the Government relative to the coinage and delivery of silver dollars. The balance of such silver received (50 percent) is coined into standard silver dollars, and these dollars—or an equal number of other standard silver dollars—are delivered to the owner or depositor of such silver. The silver deducted by the Government is retained as bullion by the Treasury and is not to be disposed of prior to the 31st day of December, 1937, except for coining into United States coins.

This proclamation, which gave 64.646 cents per fine ounce to producers of newly mined silver as against a world market then of 43 cents plus a high degree of assurance that the new price would continue for four years from January 1, 1934, almost immediately reopened those few mines in the United States which had ore reserves containing appreciable silver value. The higher silver price also helped to keep certain lead-silver mines from closing down, and reopened other lead-silver and copper-silver mines, though lead and copper prices were low (and remained so). The result was a very appreciable increase in the production of silver during 1934, as shown in the accompanying table.

Details by states have already been published in Mineral Market Reports of the U. S. Bureau of Mines, and final figures showing the output of gold and silver by states, counties, and districts

MINE PRODUCTION OF SILVER IN THE UNITED STATES, BY STATES AND REGIONS,
1933-34, IN TERMS OF RECOVERED METAL

State or Territory	1933 (fine ounces)	1934 (fine ounces)	Increase or decrease Fine ounces	Pct.	Value	
					1933 at \$0.35 per ounce	1934 at \$0.646 per ounce
Western States and Alaska						
Alaska	155,334	160,033	+ 4,699	+ 3	\$54,367	\$103,381
Arizona	2,390,363	4,150,000	+ 1,759,637	+ 74	836,627	2,680,900
California	402,591	789,000	+ 386,409	+ 96	140,907	509,694
Colorado	2,186,140	3,389,552	+ 1,203,412	+ 55	765,149	2,189,651
Idaho	6,987,960	7,310,000	+ 322,040	+ 5	2,445,786	4,722,260
Montana	2,660,700	3,950,000	+ 1,289,300	+ 48	931,245	2,551,700
Nevada	1,148,621	2,700,000	+ 1,551,379	+ 135	402,017	1,744,200
New Mexico	1,181,580	1,058,232	- 123,348	- 10	413,553	683,618
Oregon	20,760	58,900	+ 38,140	+ 184	7,266	38,049
South Dakota ...	125,417	100,376	- 25,041	- 20	43,896	64,843
Texas	160	816,623	+ 816,463	*	56	527,538
Utah	5,669,197	6,985,000	+ 1,315,803	+ 23	1,984,219	4,512,310
Washington	18,520	40,000	+ 21,480	+ 116	6,482	25,840
Wyoming	260	893	+ 633	+ 243	91	577
	22,947,603	31,508,609	+ 8,561,006	+ 37	8,031,661	20,354,561
Eastern States						
Alabama .....	.....	364	+ 364	.....	.....	235
Georgia	51	46	- 5	- 10	18	30
North Carolina..	180	9,837	+ 9,657	*	63	6,355
Pennsylvania ...	2,197	4,004	+ 1,807	+ 82	769	2,586
South Carolina..	32	68	+ 36	+ 113	11	44
Tennessee	28,083	61,450	+ 33,367	+ 119	9,829	39,697
Virginia .....	.....	78	+ 78	.....	.....	50
	30,543	75,847	+ 45,304	+ 148	10,690	48,997
Central States						
Illinois	1,422	.....	— 1,422	.....	498	.....
Michigan	125,926	529	— 125,397	- 100	44,074	342
Missouri .....	.....	136,000	+ 136,000	.....	.....	87,856
Oklahoma .....	.....	54	+ 54	.....	.....	35
	127,348	136,583	+ 9,235	+ 7	44,572	88,233
Philippine Is.	181,372	226,524	+ 45,152	+ 25	63,480	146,335
Puerto Rico .....	.....	11	+ 11	.....	.....	7
	181,372	226,535	+ 45,163	+ 25	63,480	146,342
Total....	23,286,866	31,947,574	+ 8,660,708	+ 37	8,150,403	20,638,133

* Increase more than 1,000 percent.

with classes of ores and content of gold and silver in ores containing these metals in recoverable quantity mined in the United States during 1934, will appear in the Minerals Yearbook, to be issued in August, 1935.

GOLD production in the United States (including the Philippines and Puerto Rico) in 1934 exceeded in dollars the value of the peak quantity year; namely, 4,887,604 ounces at \$20.6718 per ounce, or \$101,036,000 in 1915. The average weighted price for 1934 was \$34.95, and the ounces produced were 3,067,389, making a total of \$107,205,247. From January 1 to January 15, 1934, the Reconstruction Finance Corporation bought gold, both domestic and foreign, at a daily posted price which remained unchanged at \$34.06 per ounce. On January 15, the RFC ceased dealing in the foreign gold market and the buying of domestic gold was turned over to the Treasury Department. From January 16 to January 31, the Treasury De-

partment through the Federal Reserve Bank bought domestic gold at the unchanging price of \$34.45 an ounce. From February 1 to December 31, the United States Mint bought both domestic and foreign gold at the fixed price of \$35 an ounce, under the Gold Reserve Act of 1934, under which the President, on January 31, fixed the weight of the gold dollar at 15 5/21 grains nine-tenths fine and took title for the Government of all the supplies of American-owned monetary gold. Thus was born the 59.06+ cent dollar, arrived at by dividing \$20.6718 (the old statutory price of an ounce of gold) by \$35. Multiplying \$35 by 0.5906+ gives \$20.6718. The average weighted price paid for domestic gold in 1934 is calculated at \$34.95. The average weighted price in 1933 was calculated at \$25.56.

Due to the length of time and the relatively large capital investment necessary to bring into production a mining venture of any magnitude, the investing public has been reticent to put money

into new ventures owing to the uncertainty of our monetary policy. Many who showed an active interest in new gold ventures have no doubt considered it prudent not to invest unless investigation and examination indicated a profit at the old statutory price of \$20.6718 per fine ounce, for they felt that index prices of labor and supplies would eventually catch up with the \$35 price. The new capital which has gone into gold mining in 1934 has been small and has been released with hesitation. There has been a plethora of power-shovel and drag-line installations on old placer areas, sometimes made without careful consideration of the first principles of placer mining. Here and there successes have been made.

The Gold Reserve Act of 1934 has resulted in prolonging the life of developed and going profitable gold mines by allowing treatment of lower grade gold content of rock and gravel. This result (treating lower gold content) has been universal—in Canada, Australia, South Africa, and the United States. Only with respect to South African gold mines have stockholders been heard to urge mining only that content profitable under the \$20.67 price and thus demanding the distribution of larger dividends from the present high price.

In the United States, the high gold price has, in some instances, saved whole communities from extinction, and in other instances, but for the same reason, revived dead or nearly dead gold districts. That is, the high gold price has lifted certain gold ores out of the sub-marginal (below profit) class into a small but certain profit class. This stimulus promises life to such districts as long as it is continued. The results of the increased gold price for 1934 have been the keeping alive of certain communities and of greatly aiding employment.

While the practical effect of the Gold Reserve Act of 1934 served to augment the nation's gold and silver reserves, other factors reduced the availability of gold from the complex ores; for example, within the 13 Western States and Alaska 62,140,835 tons of copper ore in 1929 yielded 434,986 ounces of gold and 18,020,842 ounces of silver, as compared with 8,363,586 tons yielding 108,727 ounces of gold and 5,854,510 ounces of silver in 1933. The adoption of the NRA code which went into effect on April 26, 1934, and resulted in fixing the copper price in the United States at 9 cents a pound, materially helped copper production in some of the states and contributed a slightly increased gold (and silver) output from copper ores as compared with 1933 results. The vast copper ore reserves of the United States have associated with them large quantities of gold and silver which can be made available as time justifies the production. Also in 1929 zinc-lead ore amounting to 3,496,400 tons recovered 0.022 ounce gold per ton and 4.47 ounces of silver per ton, as compared with 1,182,311 tons of 0.036 ounce gold per ton and 5.21 ounces silver per ton in 1933.

GOLD MINE PRODUCTION IN THE UNITED STATES, BY STATES, 1934

	1933 Fine ounces	1934 Fine ounces	Increase or decrease Fine ounces	Pct.	Value 1933 (at \$25.56 per ounce)	1934 (at \$34.95 per ounce)
Western States and Alaska						
Alaska	457,274	541,283	+ 84,009	+ 18	\$11,687,923	\$18,917,841
Arizona	79,992	157,000	+ 77,008	+ 96	2,044,596	5,487,150
California	613,579	701,000	+ 87,421	+ 14	15,683,079	24,499,950
Colorado	242,828	317,214	+ 74,386	+ 31	6,206,684	11,086,629
Idaho	64,592	86,600	+ 22,008	+ 34	1,650,972	3,026,670
Montana	57,822	92,500	+ 34,678	+ 60	1,477,930	3,232,875
Nevada	98,590	146,700	+ 48,110	+ 49	2,519,960	5,127,165
New Mexico	26,474	25,630	- 844	- 3	676,675	895,769
Oregon	20,240	32,200	+ 11,960	+ 59	517,334	1,125,390
South Dakota ...	512,404	481,727	- 30,677	- 6	13,097,046	16,836,359
Texas .....	.....	368	+ 368	.....	.....	12,862
Utah	109,130	134,100	+ 24,970	+ 23	2,789,363	4,686,795
Washington	4,563	6,900	+ 2,337	+ 51	116,630	241,155
Wyoming	2,200	4,900	+ 2,700	+ 123	56,232	171,255
	2,289,688	2,728,122	+ 438,434	+ 19	\$58,524,424	\$95,347,865
Eastern States						
Alabama	5	2,781	+ 2,776	*	\$128	\$97,196
Georgia	435	900	+ 465	+ 107	11,119	31,455
Maryland	15	.....	- 15	.....	383	.....
North Carolina ..	648	666	+ 18	+ 3	16,563	23,277
Pennsylvania	247	557	+ 310	+ 126	6,313	19,467
South Carolina ..	160	223	+ 63	+ 39	4,090	7,794
Tennessee	223	531	+ 308	+ 138	5,700	18,558
Virginia	19	529	+ 510	*	486	18,489
	1,752	6,187	+ 4,435	+ 253	\$44,782	\$216,236
Central States						
Michigan	8	49	+ 41	+ 513	\$204	\$1,713
Philippine Is.	279,535	332,974	+ 53,439	+ 19	\$7,144,915	\$11,637,441
Puerto Rico	29	57	+ 28	+ 97	741	1,992
	279,564	333,031	+ 53,467	+ 19	\$7,145,656	\$11,639,433
Total	2,571,012	3,067,389	+ 496,377	+ 19	\$65,715,066	\$107,205,247

* Increase more than 1,000 percent.

Details by states have already been published in Mineral Market Reports of the U. S. Bureau of Mines, and final figures showing the output of gold and silver by states, counties, and districts with classes of ores and content of gold and silver in ores containing these metals in recoverable quantity mined in the United States during 1934, will appear in the Minerals Yearbook, to be issued in August, 1935.

There are two methods of determining gold (and silver) output of the United States: (1) The U. S. Bureau of Mines method of direct reports from producers plus receipts at smelters and mints; (2) the U. S. Bureau of the Mint method, utilizing arrivals of refined bullion at United States Mints and Assay Offices and at private refiners. By cooperation between the two Bureaus, credit to individual states are carefully ironed out. The combined total output of refined domestic gold as given by the Bureau of the Mint for the last 29 years shows the small excess of 0.39 percent gold (and 0.67 percent silver) over the total mine output of gold produced in the United States, as stated by the Bureau of Mines. For the larger states, either method continuously used gives over a period of years practically the same total. In the table that follows, the U. S. Mint figures are used for both 1933 and 1934 for Alaska, Philippines, Puerto Rico, and eastern United States; U. S. Bureau of Mines figures are used for both years for Central and Western States.

Iron and Steel

MORE THAN \$125,000,000 has been budgeted by the steel industry for new equipment and plant modernization during 1935, according to an informal poll of steel manufacturers recently completed by the American Iron and Steel Institute, and appearing in "Steel Facts."

It is estimated that by December 31, 1935, the finished steel capacity of the industry will be about 3,000,000 tons more than the aggregate capacity on December 31, 1933.

Lead and Zinc

THE YEAR 1934 showed remarkable stabilizing influences in the zinc industry of the Joplin-Tri-State zinc district, according to a review presented by the American metal market. Operations were so gauged that production was made to practically balance demand when measured by the yard stick of

monthly stocks. At no time did stocks go above 22,000 tons or approximately three weeks' average shipments and for most months did not exceed two weeks.

The year opened with stocks at approximately 12,000 tons and by the end of January had risen to 18,570 tons. Curtailment set in and they were held down to 13,000 to 15,000 tons till the end of May. June saw production leap upward and by the end of the month stocks had risen to the highest point of the year when they registered 21,940 tons. Curtailment again set in and by the end of the month of July they were down to 13,220 tons. From this time to the end of the year they were held in check so that they vacillated between that figure and 17,750 tons. The year closed with stocks at 15,595 tons.

Production of zinc concentrates showed an increase approximately 15 per cent for the year as measured in the shipments from the district. A total of 307,193 tons of zinc concentrates were shipped for the period which compares with 267,900 tons in 1933. June, September and December were months in which shipments ran from 32,000 to 36,000 tons while shipment and production fell to the minimum of 11,820 tons in July. The remaining months of the year were all nearly alike.

So far as price levels were concerned, the average of 1934 was only .2 higher than 1933. The average price for all grades in 1934 was \$27.14. The year opened at \$25 to \$26 and closed singularly enough at the same level. The months of February, March, April and May saw prices rise to a level of \$28 to \$30, sagging in June and holding steady at \$28 for July and August, then dropping to the level of \$25 to \$26 averages for the remaining months. The increased value of \$1,135,035 for the shipments of the year came largely from the increased tonnage marketed.

The lead producing industry showed a decrease in shipments, production and price as compared with 1933. The loss in shipments approximated 4 per cent. Shipments for 1934 were 33,330 tons, as compared with 34,857 tons in 1933. Stocks remained fairly uniform for the first nine months of the year but gradually increased the last three months. The year opened with stocks at 10,475 tons, rose to 12,000 at the end of January. By October they had risen to 14,200 tons and closed at the end of the year at 15,010 tons.

Prices held steady at \$42.50 for the first quarter, then rose to \$45 and \$46 in April and May after which the decline was steady till October when the price level was as low as \$32 to \$33. November showed a small upward reaction to \$35 then dropped again to \$33 and \$34 for the last month of the year. The average for all the year was \$39.77 as compared with \$46.27 in 1933.

The two major trends of activity in the Oklahoma field during 1934 were the increasing growth of the central

milling idea, and the increasing growth of tailing mills. Both of these trends indicate the large degree of depletion that is taking place in the Oklahoma and Kansas fields with respect to ores rich enough to meet the present price levels existing in the industry. Had it not been for the adoption of the central milling system many shafts now producing a small tonnage of millable ore would not be producing at all and hence the production of primary concentrates from ore has been sustained in a much larger volume than would have been possible under the old system of individual milling units.

The trend toward more and more tailing mills has also resulted in holding up production of zinc concentrates but this large source of reserves is also rapidly disappearing. From 1,500 to 2,200 tons of concentrates per week have come from this source in 1934.

THE BULLETIN of the Tri-State Zinc and Lead Ore Producers' Association, reports as follows for the week ending February 23, 1935:

	ZINC CONCENTRATES			LEAD CONCENTRATES		
	This Week	Last Week	Year Ago	This Week	Last Week	Year Ago
Total stocks (sold and unscl)	14,995	15,570	10,363	16,498	16,155	12,604
Net reserve stock	13,777	13,914	10,141	16,498	16,155	12,267
Production*	7,658	7,557	3,197	897	714	299
Shipments	8,233	7,550	5,422	554	194	338
Sales reported	7,795	7,440	5,206	554	190	82
*Included tailing mill production	1,826	1,669	778	—	—	—
Base price—Joplin	\$26.00	\$26.00	\$30.00	\$33.00	\$33.00	\$42.50
Metal price—Average for week:						
Zinc, E. St. Louis; lead, St. Louis..	3.700c	3.700c	4.400c	3.400c	3.387c	3.900c

Mill Statistics

	This Week	Last Week	Year Ago
Mine mills operated 32 hours or more	29	26	14
Mine mills operated less than 32 hours	1	3	3
Tailing mills operated 96 hours or more	15	16	8
Tailing mills operated less than 96 hours	1	0	3
	—	—	—
Total mills which produced more than 25 tons during week	46	45	28
Mills which produced less than 25 tons during week	5	5	4
	—	—	—
Total number of mills operated during week	51	50	32

Mine Mills Operated This Week: Admiralty No. 2; American Diamond; Black Eagle; Byrd Mary Jane; CM&R Bird Dog; See Sah & Wilbur; VH. Barr; Century Scott; Dines Wilson; Denny; EP Central; EW No. 4; Federal Jarrett; Bluebonnet; K&O Discard; Lost Trail; Luck OK; Luck OX; Peru; Mary M Beck; Mid-Continent; Mission; New Blue Mound; Playter; Prairie Chicken; Rialto; St. Louis No. 4 & No. 8; UZ Royal; Velie Lion; Meteor; St. Nicholas.

Tailing Mills Operated This Week: Atlas; Bailey; Britt; Cardin; CM&R Beaver; Webber; King Brand EW No. 7; Peru Laclede; G&S; Interstate Woodchuck; Lawyers; Myers; Semple Rightley; Skelton; Mo. Chitwood; Tri-State Ottawa; Youngman.

A STAY of the hours provision of the lead industry's code, to permit a maximum working period of 16 hours in 24 to meet the occasional requirements of changing shifts, has been extended 60 days by the National Industrial Recovery Board. The extension is effective February 16, 1935, when the stay would have expired.

The extension may be terminated upon approval of a code amendment carrying out the purpose of the stay. An amendment on the subject has been submitted to NRA by the Code Authority.

THE Republic Steel Corporation has just signed an agreement to make and sell "Seal of Quality" 2-ounce coated galvanized sheets under the standard license issued by the American Zinc Institute. This action of the Republic Steel Corporation, one of the largest and most progressive concerns producing galvanized sheets, represents strong endorsement of the Institute's program for improving the quality of the product; it

means that the results being obtained by the Institute in protecting the name and reputation of zinc-coated sheets are being more and more appreciated.

Most consumers of galvanized sheets have in the past few years, through the activities of the Institute, learned the value of the guarantee carried by the "Seal of Quality" brand, and sales of heavy-coated sheets are steadily gaining in volume. The cooperation in the "Seal of Quality" program offered by various distributing agencies is also steadily improving, and it will not be long before the knowledge of "Seal of Quality" sheets will be universal.

The companies now participating in the "Seal of Quality" movement represent approximately 85 per cent of the galvanized sheet capacity of the United States.

NEWS OF MANUFACTURERS

MANUFACTURERS and users of heavy duty direct current generators, motors and rotary converters will be interested in the announcement by the Carbon Sales Division of National Carbon Company, Cleveland, Ohio, of a new series of electrographitic brushes designed especially for service on heavy duty direct current equipment.

The company states that this new series of brushes is the product of a four-year program of research applied to the problem of determining the fundamental physical properties essential to satisfactory brush performance on heavy



duty direct current equipment, the combinations of materials possessing these necessary properties, and exact methods of production control to insure uniformity in both product and performance.

The new series of brushes resulting from this program are to be known as the "SA" Series of National Pyramid Brushes. The series consists of five grades namely, SA-25, SA-30, SA-35, SA-40, and SA-45.

A new trade mark identification has been established by National Carbon Company for the new "SA" Series. In addition to the now familiar trade marks, the Three Pyramids and the Silver Strand Cable, the new series will be further identified by the *double engraved lines* down the center of one side of the brush, as shown in the above illustration.

THE 18TH Annual Convention of the Technical Section, Explosives Department, E. I. du Pont de Nemours & Company, was held at Wilmington, Del., January 22 to 25. Arthur La Motte, manager of the section, presided.

Lammot du Pont, president of the du Pont Company, and J. Thompson Brown, a vice president, addressed the convention, welcoming those in attendance. J. W. McCoy, general manager of the Explosives Department, reviewed the activities of last year.

There were discussions of 350 topics relating to types of explosives and blasting accessories and their uses in mining, quarrying, highway and other construc-

tion, river and harbor work, and for agricultural purposes.

The convention was attended by 345 men engaged in various branches of the explosives industry. Those present included technical field men from all parts of the country, the staff of the home office of the technical section, executives of the Explosives Department, plant managers, explosives chemists, explosives salesmen and others.

A revolutionary new blasting material for use in quarries and in other blasting operations such as stripping, was announced. This new product, it was stated, cannot be detonated by the strongest commercial blasting cap, by impact, by flame, nor by shooting a rifle bullet into it. In actual use it is exploded by means of a large diameter cartridge of dynamite. It is non-headache producing and is rendered absolutely water resistant by being sealed up tightly in a tin can. It is stated to represent the ultimate in safety in so far as a blasting agent is concerned. It represents a very radical departure in the explosives field. This new development has been covered by two patents, one for the product itself and the other covering its method of use. It is non-freezing. It was announced yesterday that it will be known as "Nitramon."

The new product will be marketed only in large diameters, for example, four inch, four and one half inch, five inch and seven inch. It is adapted solely for use in large diameters and has been designed specifically to fulfil as nearly as possible the ideal qualifications for use in quarries and in coal stripping operations.

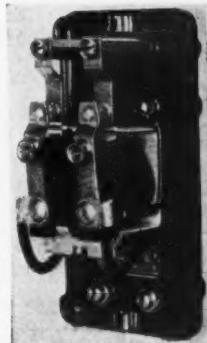
A NEW Carbide Police Emergency Light weighing only forty pounds when fully charged, and which burns for three hours, giving 8,000 candle power, has recently been announced by the Na-



tional Carbide Sales Corporation, Lincoln Building, New York City. Announced as a Police Emergency Light, it has many other applications in the municipal, aviation, railroad and construction fields.

The unit is three and one-half feet high when extended for use, and twenty-eight inches when folded. A 1½ pound charge of carbide placed in the hopper is sufficient for over three hours.

A SMALL, sturdy, low-priced auxiliary relay for use on a.c. or d.c. and suitable for switchboard or panel mounting is announced by Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. The type SK auxiliary relay for switchboard mounting has a molded cover or molded cover with glass front; the front connected panel mounted relay uses no cover. Both types have two independent contact circuits which may be easily adjusted for circuit-closing



or circuit-opening service. For two independent opening circuits, additional material must be added to the standard relay. Designed for continuous duty at rated voltage, the SK relay is obtainable for circuits up to 550 volts a.c. or 440 d.c. Ranges up to 250 volts can be used for intermittent duty up to approximately three times their continuous value. The relay can be supplied with a coil for any current value up to 5 amperes.

Relay is adapted for any thickness of panel material from $\frac{1}{8}$ " (steel) to 2" (slate). The molded terminals are $1\frac{1}{8}$ " long, being ample for steel-panel mounting.

Each contact will carry 12 amperes continuous and 20 amperes for one minute. The non-inductive rating:

Volts d.c.	Interrupting rating, Amperes, d.c.	Interrupting rating, Amperes, a.c.
24	12	20
48	6	20
115	3	20
230	1.25	10
550	0.25	3

Snubbing

(Continued from page 55)

feet up from the bottom, one hole in the center and one on each rib, and with one stick of permissible in each hole the snubbings are shot down on this pan. By means of the chains shown the drag is coupled to a locomotive and the snubbings dragged out leaving the place ready to shoot. At other plants other methods are in use, most of them successfully. I know of one commercial mine where the 1½" screenings were decreased fifty percent by changing the style of snubbing. Practically all of the coal produced by the Superior Coal Company is mined with mounted cutting machines which cut up in the seam and leave a rounded kerf. The rounded kerf is an aid to snubbing and shooting. The bottom is shot up first, and loaded separately and the snubbing is done at that time. In the territories where short-walls are used the snubbing is shot and loaded out before the top is blasted. It is not only important that the coal be loose for loading but that the face be left in a safe condition. Improper snubbing not only ruins the product, but causes extra labor in squaring up loose and dangerous faces.

The entire production of the Superior Coal Company is used as locomotive fuel and after being hoisted is crushed to the proper size for engine use. It has been found efficient to employ at each of the mines an assistant to the mine manager whose sole duty is to oversee and direct the face preparation with especial emphasis on the snubbing.

Every well wisher of the coal mining industry is proud of the improvement made in equipment, in technique and in quantity production during the past few years. The advantages of these improvements have been not only to the operation in being able to produce its product at less cost, but also to the miner whose work is being elevated from the danger and drudgery of other days. The load has been heavy for the mine foreman and some of the essentials may have been lost on the way.

No one, of course, would assert that the answer to proper face preparation would be to return to the methods of other days. Neither should one believe that the improvements in mining have not been real and beneficial, but it is well to remember that real efficiency in mining comes from a constant and strict adherence to the elementary principles.

The dictionary defines "snubbing" thusly: "Treat with contemptuous neglect." I wonder.

THE National Industrial Recovery Board announced approval of the supplemental code of fair competition for the mine car manufacturing subdivision of the machinery and allied products industry.

The code carries the same general labor provisions of the master machinery code, with the basic 40-hour maximum work week and minimum 40-cents an hour wage rate.

The mine car manufacturing subdivision includes the manufacture for sale or lease of non-powered wheeled vehicles not exceeding 350 cubic feet level full capacity such as are customarily used in coal mining; chilled cast iron mine car wheels, and parts and repairs for such vehicles.

Included in the code are provisions containing definitions, methods and procedures for handling bids, price filing, discounts, other trade practices, and a Code Authority of seven industry members.

Annual sales dropped from \$7,668,520 in 1929 as compared with \$2,529,967 in 1933, while employment declined from 1,651 in 1929 to 1,323 in 1933, or 19.8 percent, it was reported.

The code was approved by the Board on condition that certain provisions regarding price filing would be stayed and others deleted.

Hoisting Problems in Lead-Silver Mines of Utah

(Continued from page 60)

line as in the letter "H." One side leg of the H has full forward travel for Hoisting, with reverse travel (used for plugging) stopped at the first notch. The other side leg of the H has full reverse travel for Lowering, with the forward travel (used for plugging) stopped at the first notch. This arrangement gives very quick and safe stopping of the hoist provided that the motor is designed for "plugging" service, and that the total resistance cut in at the plugging position is properly selected. Properly designed plugging gives quicker handling of the hoist with less wear and tear on the brake mechanism. Many liquid rheostats have been used, but the maintenance has been prohibitive except in the one case at the Daly Judge shaft which has been operating for 15 years with practically no maintenance expense. This comprises a large heavy three phase electrode assembly, moved up and down by an oil pressure cylinder controlled in the same general manner as an oil pressure brake. The upward movement is rapid, but the downward movement (for accelerating) cannot exceed the preset rate of travel. This device had the merit that it eliminated all the secondary contactors with their interlock control circuits, relays etc.; but the more recent designs of contactors and control circuits have been so well perfected that there is no longer any maintenance trouble to be feared.

Probably the only new developments to be expected in the immediate future are installations of medium size hoists with automatic control. This will entail the use of a suitable type of Ward-Leonard control.

Mining and Metallurgical Engineers Hold Annual Meeting

(Continued from page 66)

Achievement Medals Awarded

At the annual dinner meeting awards for distinguished achievement in the industry were made.

Howard N. Eavenson, retiring president of the Institute, was chairman and toastmaster and introduced Dr. Henry A. Buehler of Rolla, Mo., his successor.

James MacNaughton, president and general manager of the Calumet & Hecla Consolidated Copper Company of Calumet, Mich., was awarded the William Lawrence Saunders Medal for his accomplishments in copper mining.

The James Douglas Medal, for achievement in non-ferrous metallurgy, was presented to George C. Stone, of New York, an authority on the extraction of zinc.

The J. E. Johnson, Jr., award was presented to Francis M. Rich of the Republic Steel Corporation, Youngstown, Ohio, "for meritorious work in the development of blast furnace operation under conditions of slow blowing."

Thomas Arthur Rickard of Victoria, B. C., received a certificate of honorary membership in recognition "of his outstanding achievement as a proponent and preceptor of advanced standards in technical concept and writing, and his brilliant contributions to the literature of geology, mining and metallurgy, as editor, journalist and author."

Cornelius F. Kelley, president of Anaconda Copper Mining Co., introduced Mr. MacNaughton, and Walter Renton Ingalls, New York consulting engineer and head of the American Bureau of Metal Statistics, was sponsor to Mr. Stone. Mr. Rickard was presented by George Otis Smith of Washington, and Mr. Rich was introduced by Richard Peters, Jr., of Philadelphia.

Six who had been members of the Institute for 50 years were recipients of the insignia of the Institute's Legion of Honor. Thus honored were Arthur S. Dwight and Arthur L. Walker of New York, H. L. Hollis of Chicago, L. W. McKay of Princeton, N. J.; C. Snelling Robinson of Youngstown, and H. H. Webb of Santa Barbara, Calif.

Bureau of Mines

(Continued from page 65)

is an essential industry, furnishing employment to thousands, paying tremendous taxes to local, state and national governments, and forming the base for hundreds of industries, that in turn furnish employment and pay taxes. The efforts of the national committee should enlist the cooperation of all interested in the future of our mineral industries.

PERSONALS

Louis S. Cates, president of Phelps Dodge Corporation, was elected president of the United Verde Copper Company at the annual meeting of stockholders. He, together with **Cleveland E. Dodge** and **J. F. McClelland**, also Phelps Dodge officials, and **H. DeWitt Smith**, were elected directors. The following directors were reelected:

Walter H. Aldridge, **George A. Clough**, **Henry Krumb**, **John H. Hall, Jr.** and **Rodney W. Williams**.

At the organization meeting of the directors the following officers were elected:

Louis S. Cates, president; **Cleveland E. Dodge**, vice president; **John H. Hall, Jr.**, secretary; **A. T. Thomson**, treasurer; **J. E. Fisher**, assistant secretary and assistant treasurer and **George R. Drysdale**, comptroller.

At the offices of Phelps Dodge Corporation it was stated that that company had acquired a substantial interest in the stock of the United Verde Copper Company.

Opposition to the 30-hour Bill was strongly expressed by **Mr. Louis C. Madeira, III**, executive secretary of the Anthracite Institute, in the hearings before the Senate Committee on the Judiciary in Washington last Thursday. In his opening statement Mr. Madeira said that if the bill became law it would destroy the Anthracite Industry and cause irreparable injury to those who look to it for employment, substantiating this by an array of facts that it would seem difficult to controvert.

L. R. Close, president, Lehigh Valley Coal Sales Co., has been elected president of the Lehigh Valley Coal Corporation, succeeding the late **John M. Humphrey**. Mr. Close has been appointed to serve until the annual meeting of directors in April. **Frank Wagner**, general manager of the coal company, has been elected a director and placed in charge of the operating department.

M. L. Newhall, president, Berwind Fuel Co., Chicago, has been named vice president of the Berwind-White Coal Mining Company.

George Watkin Evans, consulting mining engineer, Seattle, Wash., visited San Francisco on professional business the middle of February. While in California he examined a gold property on the Mother Lode near Placerville.

Charles F. Williams, of Miami, Okla., supervision engineer, U. S. Geological Survey, has been elected chairman of the Joplin-Miami section of the A.I.M.M.E., succeeding **L. G. Johnson**, of Baxter Springs, superintendent of the Tri-State holdings of the Federal Mining & Smelting Company. **John R. Reigart**, manager, Iron Mountain Lead & Zinc Company, has been elected vice-chairman, succeeding **George M. Fowler**; and **M. D. Harbaugh** has been reelected secretary.

Robert Gregg, president, Tennessee Coal, Iron & Railroad Company, has been elected vice president in charge of sales of the United States Steel Corporation.

Among the prominent visitors to Washington during February were: **D. D. Muir**, U. S. Smelting, Refining & Mining Company; **Carroll Sears** of the Empire Star Mines; **Philip Wiseman** of Los Angeles, California; **W. L. Haehnlen**, Tonopah Mining Company; **Paul Weir**, Bell & Zoller Coal & Mining Company; **F. S. Pfahler**, Superior Coal Company; **S. A. Taylor** of Pittsburgh, Pa.; and **Chas. M. Seymour** of Knoxville, Tenn.

R. E. Salvati, vice president, Pond Creek Pocahontas Coal Company, has been spending some time recently in Florida.

The *Washington Times* of February 13 has the following editorial notice of the late and sincerely lamented **John Markle**:

"John Markle, who died in New York recently, made a fortune in the coal business. While he was making money he gave away lots of it—huge sums to charities, hospitals, medical research, libraries, educational institutions.

"Of the \$16,595,235 in his net estate at the time of his death, \$14,402,463 was left to charity.

"John Markle was a real American, a good American. His name and his deeds symbolize a high type of humane patriotism.

"If the New Dealers have their way, the country will have no more John Markles, and will be the poorer, not only in money but in the more important currency of philanthropy and good will." *Anthracite Institute*.

H. S. Wardner, treasurer and general counsel of the New Jersey Zinc Company, died on March 5, after an illness of two months.

Morris Williams died January 25. Mr. Williams was a well known figure in the coal industry. Among his many affiliations, he was for several years president of the Susquehanna Coal Company and the Glogora Coal Company, which company he organized.

The metal mining industry suffered a keen loss through the sudden death of **Imer Pett, Sr.**, due to a heart attack, on February 25. Mr. Pett was a leading figure in the Utah mining industry for many years. He was one of the organizers of the Utah Chapter of The American Mining Congress, having served as Governor of the Chapter at different times for a total of six years, and was a member of the Board of Directors from its beginning until the date of his death. He was 59 years of age and at the time of his death was managing director and member of the brokerage firm of Ure, Pett & Morris, Inc., Salt Lake City, Utah. A real loss is felt by his numerous friends and associates.



Imer Pett

Edward Hughes, vice president and controller, Lehigh Navigation Coal Company and subsidiaries, died January 22, as a result of pneumonia. Mr. Hughes was 65 years of age and had been connected with the company for more than 28 years.

John Julian Boarman, retired president of the Hudson Coal Company, died on January 16.

William E. Mackay, of Boston, Mass., died March 1 after a three-weeks' illness. Captain Mackay was president of the New England Coke Company of Boston, chairman of the board of the Mystic Iron Works, trustee of the Eastern Gas & Fuel Associates, and a director of the Koppers Coal & Transportation Company and Federal Coal and Coke Company. He was 70 years of age.

THE FUEL CONFERENCE of coal men and stoker manufacturers, sponsored by the University of Wisconsin, was held in Madison, in January. The delegates were welcomed by F. E. Turneaure, Dean of the College of Engineering, after which Professor B. G. Elliott of the University Extension Division, presented a paper on "Analysis and Classification of Solid Fuels." General discussion was held on "Principles of Combustion and Flue Gas Analysis" by Parker A. Moe, National Educational Director, National Association of Power Engineers.

Of outstanding importance was the address delivered by Carlyle M. Terry, special Western representative, Delaware, Lackawanna & Western Coal Company, on "Anthracite." In his presentation Mr. Terry called attention to the mistaken impression in the West that a continued supply of anthracite will not be available, pointing out that there is still 8,000,000,000 tons of recoverable anthracite in the fields. In tracing the development of anthracite through its producing years, Mr. Terry paid special tribute to the Anthracite Institute for its work in developing new uses.

W. E. E. Koehler, Secretary of the Pocahontas Operators Association, at Bluefield, W. Va., talked on the characteristics of semi-bituminous coal and their adaptability to various purposes for different types of equipment, closing with his oft-repeated statement "the stability of the coal industry and the satisfaction of the distributors and consumers will be achieved when all coals go to work under their own names and exclusively for the purposes for which they are suited."

"Bituminous and Steam Coals" was presented by J. G. Bentley, fuel engineer, Sahara Coal Company; E. H. Kelling, president, Center Street Fuel Company, Milwaukee, addressed the meeting on "Coke," setting forth in some detail the new uses which are being continually developed. A. P. King, president, and R. P. Botsch, plant superintendent, United Coal and Dock Company, Milwaukee, discussed briquets. J. A. Gitzen, of Milwaukee, presented material on "Dust Control" and L. P. Crecelius, consulting engineer, North American Coal Corporation, Cleveland, discussed "The Treating of Coal for Sulphur Correction."

Other subjects presented were "Purchasing Coal on Specification," by W. D. Langtry and Joseph Harrington. "Buying and Marketing Solid Fuels," by Norvin H. Vaughan.

"The New Technique in Fuel Burning," by T. A. Marsh. "Principles of Underfeed Stoker Firing and Selection of Underfeed Stoker Fuel," by H. E. Winkler. "Installation and Servicing of Domestic Underfeed Stokers," by B. M. Guthrie.

"Fuel Dealers Obligations to the Consumers," by Marc G. Bluth, Executive Secretary, Committee of Ten. "Handling Heating Complaints," by D. W. Howe, District Manager, Coal Bureau, Norfolk and Western Railway Company.

"Industrial Fuel Engineering Service," by J. E. Tobey, Manager, Fuel Engineering Division, Appalachian Coals, Inc.

"Principles of Overfeed Stoker Firing and Selection of Overfeed Stoker Fuel," by J. A. Hoffman. "Control Equipment for Stokers," by P. L. Tolerton. "The A. B. C. of Air Conditioning," by G. L. Larson, Professor of Steam and Gas Engineering, Chairman of Department of Mechanical Engineering, University of Wisconsin.

"Effect of Building Construction on Fuel Consumption," by Frank B. Rowley, Professor of Experimental Engineering, University of Minnesota. "Economical Operation of the Heating Plant," by John J. Novotny, Power Plant Engineer, Heating Plant, University of Wisconsin.

NOW WE CAN ALL BREATHE EASIER



—Washington Daily News

FOllowing is the announcement of the NRA on the scrip question: "Solution of the scrip problem by prohibiting the use of scrip in payment of wages has been recommended by the NRA Advisory Council to the National Industrial Recovery Board. The recommendation is now before the Board, and an early announcement of policy is anticipated.

"Both the Advisory Council and the NRA special scrip committee found that the best approach to the scrip problem was through codes of industries making payment of wages in scrip, as has been done in the code for the bituminous coal industry.

"The Advisory Council suggested provisions for inclusion in codes for scrip issuing industries, naming the lumber, steel and textile codes as 'the most important needing such action.'

"The text of the Advisory Council's recommendation follows:

"The Council believes that elimination of the scrip problem would best be dealt with in the codes for industries making payment of wages in scrip, as has been done in the bituminous coal code. Among the most important needing such action

are the lumber, steel and the textile codes, through provision along the lines suggested in the following draft:

"1. Each employer shall make payment of all wages due at the end of each week in lawful currency or by negotiable demand check. If checks are given, the employer shall provide reasonable accessible facilities for cashing checks at face value without expense to the employee. Employers shall also provide such identification as is necessary to utilize such facilities.

"2. These wages shall be exempt from any charges, fines, or deductions, except payments for pensions, insurance or sick benefits which are voluntarily paid by the wage earners or required by state law. No employer shall withhold wages. Employers or their agents shall not accept directly or indirectly rebates on such wages or salaries nor give anything of value or extend any favors to any person for the purpose of influencing rates of wages or working conditions of their employees.

"3. No employee shall be required as a condition of employment to trade at a store or to rent a home specified by the employers.

"The action taken could be through voluntary amendments after public hearings for individual cases."

THE SALES of lime in 1934 by producers in the United States amounted to 2,407,000 short tons valued at \$16,996,000, according to preliminary figures furnished by lime manufacturers. This was an increase of 6 percent in quantity and 19 percent in value compared with sales of 2,269,280 tons valued at \$14,235,659 in 1933. The average value per ton in 1934 was \$7.06; in 1933 it was \$6.28. The total sales of lime in 1934 included 830,000 tons of hydrated lime valued at \$6,346,000, a decrease of 1 percent in quantity with increase of 13 percent in value compared with 1933 (840,007 tons valued at \$5,622,026). The average value per ton of hydrated lime in 1934 was \$7.65; in 1933 it was \$6.69.

Preliminary reports of sales of lime in 1934, according to classes were as follows: Building lime, 558,000 tons valued at \$4,529,000, compared with 533,088 tons valued at \$3,828,594 in 1933, an increase of 5 percent in quantity and 18 percent in value; chemical lime (not including dead-burned dolomite), 1,296,000 tons valued at \$8,277,000, compared with 1,228,270 tons valued at \$7,041,949 in 1933, an increase of 5.5 percent in quantity and 17.5 percent in value; dead-burned dolomite (refractory lime), 309,000 tons valued at \$2,585,000, compared with 261,812 tons valued at \$2,064,869 in 1933, an increase of 18 percent in quantity and 25 percent in value; agricultural lime, 244,000 tons valued at \$1,605,000, compared with 246,110 tons valued at \$1,318,247 in 1933, a decrease of 1 percent in quantity but an increase of 22 percent in value.

Bit Sharpening Economies

(Continued from page 52)

Coal drills are handled in the same way by the supply trucks to and from the mines. A forge and anvil was placed in one end of the shop, especially for sharpening drills. One blacksmith spends all of his time sharpening, welding and grinding coal drills. His helper keeps bits in the bit heater when not needed to strike for his blacksmith.

A steam hammer is used whenever possible for flattening the drill for end splitting, for welding and for forming the shank. A motor driven emery grinder is used for grinding the drills to gauge and for sharpening them.

The blacksmith and his helper work all day on coal drills and turn out about 65 sharpened and reconditioned coal drills daily.

This centralized plan of bit and drill sharpening requires 8 man hours for bit sharpening, 14 man hours for drill sharpening and 3 man hours for gathering and delivering, a total of 25 man hours for 6,000 tons production, or 240 tons per man hour for bit and drill sharpening. This is double that realized when this work was done at each mine.

The results accomplished by centralizing the bit and drill sharpening is better shown by the table below.

This savings in labor alone amounted to 39 man hours per day.

Power Economies

(Continued from page 58)

strength, iron transmission wire is used. The wire is suspended from wooden poles by five-disc Locke insulators.

The 1930 improvements, Items (1), (2), (3) and (4), which placed all the mines on the single metering equipment and more favorable schedule, cost complete \$35,594.43.

Since September, 1930, the power consumption has increased from a minimum demand of 1,400 H.P. and 380,000 K.W.H. to as high as 1,850 H.P. and 656,000 K.W.H. The tabulated data below shows the average horse-power, the total quantities in K.W.H., the calculated cost of the power, based on the former schedule, the actual cost on new schedule and the saving resulting therefrom.

In addition to the saving indicated it will be noted that the new arrangement, as indicated in Plate No. 1, provides additional security against any interruption of service. With the present hook-up, power is furnished to the mining company's workings from the Bingham substation of the power company via Niagara point of distribution. Power can also be furnished via the Jordan Narrows line of the power company to the Yosemite or No. 12 Raise should anything happen to the transmission line between Yosemite and Niagara. Each unit could in an emergency be served independently. Power peaks have been reduced.

THE Annual Meetings of the Joseph

A. Holmes Safety Association were held in Washington on March 5 and were attended by representatives of 20 of the 29 member organizations, including the American Mining Congress, National Coal Association, American Federation of Labor, American Society of Mechanical Engineers, International Union of Mine, Mill and Smelter Workers, National Safety Council, U. S. Geological Survey, U. S. Public Health Service, and numerous others.

The meeting gave "hero" awards as follows to persons in the mining and allied industries who have relatively recently given outstanding service in saving or trying to save lives in or around mines or mining industrial plants:

A gold medal to William Gilbert, Grass Valley, California.

A silver medal to Harry M. Stout, Long Beach, California.

A bronze medal to James Norton, deceased, Barnesboro, Pennsylvania.

A diploma to Jack Evans, Marvin Gordon, Alexander McDonald, Tom Ogas, Charles Peterson and Salvador Portillo, all of Pinos Altos, New Mexico.

Certificates of honor for safety achievement were given to 41 coal mines and mining companies, to 13 metal or non-metallic mineral mines or plants, to 6 petroleum organizations, and to 5 miscellaneous industry plants; 6 individuals were given certificates for long-time work in mines without sustaining an accident or for successful supervision of workers without accident occurrence to the workers.

An outstanding case was that of Harry Carroll, of Wolf Run, Ohio, who is 87 years old, yet loaded 11.3 tons of coal in a mine on February 15, 1935, and who has worked 77 years in coal mines of Ohio without sustaining a lost-time accident.

	Past System	Present System
Production	7,500 tons	6,000 tons
Bit machines in use	4	2
Tons per machine	1,875 tons	3,000 tons
Bit men required	4 @ 8 hours	2 @ 4 hours
Drill sharpeners required	4 @ 8 hours	2 @ 7 hours
Supply men (collecting and distribution) .....	.....	1 @ 3 hours
Total man hours	64	25
Tons per man hour	117½	240



We Look Into the Earth
By using Diamond Core Drills.
We prospect Coal and Mineral
Lands in any part of North or
South America.

PENNSYLVANIA DRILLING CO.
Pittsburgh, Pa.
Drilling Contractors

O. C. Hoffman, Pres. Established 1902 L. H. Hoffman, Treas.

HOFFMAN-BROS-DRILLING-CO.
—CONTRACTORS—
DIAMOND CORE DRILLING
PUNXSUTAWNEY, PA.
Our specialty—Testing bituminous coal lands
Satisfactory cores guaranteed

ROBINSON
VENTILATING COMPANY
Fans and Blowers
Ventilating Engineering Service
ZELIENOPLE
PENNSYLVANIA

UNIVERSAL VIBRATING SCREENS
Popular the World Over—Highest in Efficiency. Lowest in Cost. Write for Catalog
UNIVERSAL VIBRATING SCREEN CO.
RACINE — WISCONSIN



... modern Coal Preparation requires . .

*Modern Tipple
Remodeling Existing Tipple
Crusher Installations
Screening and Mixing Plants
Coal Washeries—Types to Suit Your Requirements
Coal Cleaning by Air Process
Combination Wet and Dry Cleaning Plants
Dedusting Plants
Revolving Dumps
Car Feeders*

Whatever your preparation needs may be, our engineers can find the proper answer. We invite you to make liberal use of our consulting service and Test Laboratory.

Roberts and Schaefer Co.

ENGINEERS and CONTRACTORS

1110 Wrigley Bldg. CHICAGO, ILL.
3232 Beachwood Blvd. 514 Ninth Avenue P. O. Box 65
PITTSBURGH, PA. HUNTINGTON, W. VA. DENVER, COLO.



INDEX TO ADVERTISERS

Allis-Chalmers Mfg. Co.	10
American Cable Co.	12
Atlas Powder Co.	6
Carnegie Steel Co.	3
Chicago Perforating Co.	82
General Electric Co.	11
Hoffman Bros. Drilling Co.	81
Lake, M. C.	82
Link-Belt Co.	7
Loftus, Peter F.	82
Mine Safety Appliances Co.	8-9
Mott Core Drilling Co.	82
National Carbon Co.	Back Cover
Ohio Brass Co.	Second Cover
Pennsylvania Drilling Co.	81
Pierce & Co., Jas. H.	82
Roberts and Schaefer Co.	82
Robinson Ventilating Co.	81
Roebling's Sons Co., John A.	5
Universal Vibrating Screen Co.	81

DIAMOND CORE DRILLING

CONTRACTORS

We make Borings for Coal, Clays and all Minerals.
Up-to-date Equipment. Gasolene, Steam and Electric
Outfits. Ask us for estimates.
MOTT CORE DRILLING COMPANY
HUNTINGTON, W. VA.

PETER F. LOFTUS

Consulting Engineers

ENGINEERING AND ECONOMIC SURVEYS. ANALYSES AND REPORTS ON POWER APPLICATIONS AND POWER COST PROBLEMS OF THE COAL MINING INDUSTRY

Oliver Building Pittsburgh, Pa.

M. C. LAKE
Consulting Geologist and Mining Engineer
Appraisals, Examinations, Explorations
1300 Leader Bldg. 909 Fidelity Bldg.
Cleveland, Ohio Duluth, Minn.

Are You a Member of
The American Mining Congress?

JAMES H. PIERCE & COMPANY

ENGINEERS AND MINE MANAGERS

A successful background in the practical solution of difficult engineering and managerial problems.
Reports—Valuations—Appraisals—Cost Analysis
Scranton Electric Building, Scranton, Pa.
Whitehall Building, New York, N. Y.

- FACTS -

about the

12th ANNUAL COAL CONVENTION AND EXPOSITION

CINCINNATI, OHIO



MAY 13-17, 1935

THE CONVENTION is under the direction of Mr. Charles F. Hamilton, Vice President, The Binkley Coal Company, and a national committee composed of SEVENTY EIGHT coal operators representing every district.

THE EXPOSITION is under the direction of Mr. George R. Delamater, Assistant to the President, W. S. Tyler Company, and a group of FORTY-EIGHT manufacturers represented in the Coal Division of The American Mining Congress.

GROUP MEETINGS have been held throughout the coal districts, and a tentative program has been arranged. Copies of the first preliminary program will be mailed the industry during the week of March 18. The topics selected by the industry for consideration this year include:

Effect of the 7-Hour Working Day on Costs—Human Engineering—Layer Loading for Uniform Product—Methods of Blasting—Mechanical Loading Under Difficult

Conditions—Power Distribution to Concentrated Mining Panels—Multiple Shifting—Anti-Freezing for Washed Coal at Tipple—High Points in Coal Cleaning in 1934—Modern Truck Hauling in Strip Mines—Methods of Preventing Theft of Coal in Transit—Handling of Cars on Conveyor or Loading—Cooperation Between Operator and Manufacturer on Equipment Design—Cleaning Coal at the Face—Car Shifting Behind Mechanical Loaders—Modern Main Line Haulage—Modern Steam Generating Plants—Air Conditioning Underground—Time Clocks and Recording Injuries—Modern Mine Ventilation—Safety Programs—Screening and Dedusting—Recent Developments in Briquetting—Treatment by Oil or Chemical to Improve Quality—Mining System—Dewatering Mines—European Methods as Applicable to U. S. Production—Locomotive and Cutting Machine Maintenance—Brakeless Mine Cars—Outside Refuse Disposal.

NINETY-SEVEN manufacturers of machinery and supplies have already contracted for space at the exposition.

A REMARKABLE convention and exposition is assured. Interest is growing daily. A splendid program will be presented, and the "MINE OF TOMORROW" will be in evidence through the very latest operating devices.

Be Sure To Be Present

THE AMERICAN MINING CONGRESS
WASHINGTON, D. C.

NEWS!

FOUR YEAR PROGRAM OF RESEARCH SOLVES THE PROBLEM OF BRUSH UNIFORMITY ON HEAVY DUTY SERVICE

THE NEW "SA" SERIES . . . FOR
HEAVY DUTY D. C. POWER SERVICE!

FUNDAMENTAL brush properties essential to satisfactory performance on heavy duty service have been more accurately determined.

New combinations of materials possessing these properties have been developed.

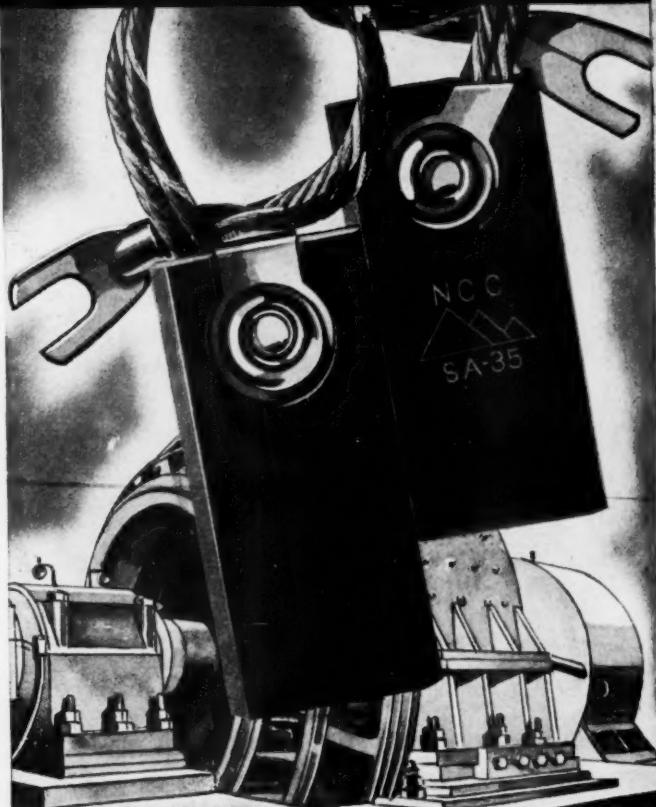
Exact methods of production insuring control of uniformity have been devised and established.

The result is the New "SA" Series of brushes designed for a wide range of applications on all types of stationary motors and generators used on heavy duty direct current power service.

The New "SA" Series consists of five carefully determined grade varieties known as SA-25, SA-30, SA-35, SA-40 and SA-45, all definitely graded with respect to commutating properties.

The exceptional uniformity of the grades in the "SA" Series has been fully established by field service tests. This uniformity applies to performance as well as to the mechanical and electrical characteristics of the brushes themselves.

Further information on the advantages and economies of these new grades in your particular service will be supplied upon request.



In addition to the regular trade marks—the Three Pyramids, the Silver Strand Cable and the Grade Number—these new grades are further identified by the Double Engraved Lines (Trade Mark Registered) down the center of one side of the brush.

NATIONAL CARBON COMPANY, INC., Carbon Sales Div., Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation
BRANCH SALES OFFICES: NEW YORK PITTSBURGH CHICAGO SAN FRANCISCO



